THE

ELECTRICAL REVIEW.

VOL. LXIX. NOVEMBER 10, 1911. No. 1,772.

ELECTRICAL REVIEW.

Vol. LXIX.] CONTENTS: November 10, 1911. [No. 1772.

	Page
The I.E.E Articles	765
Co-operation	766
British Electrical Superannuation Fund...	767
Electrical Information from Abroad	767
Correspondence :—	
Quartz in Electrical Heaters...	768
The Demand for Technical Men	768
A Reliable Rectifier Wanted	768
The Institution of Electrical Engineers	768
Proceedings of Institutions :—	
Recent Developments in the Manufacture of Incandescent Electric Lamps	769
The Institution of Electrical Engineers	770
Our Legal Query Column	773
Legal	773
New Electrical Devices, Fittings and Plant (*illus.*)	774
Metalite, Ltd.	775
Business Notes	775
Notes	783
The Commonwealth's Edison Co.'s new Power Station (*illus.*)	785
City Notes	791
Stocks and Shares	796
Market Quotations	796
Share List of Electrical Companies	797
The Electric Vehicle in America as a Profitable Off-Peak Load	799
Reviews	801
Temperature Experiment with a Cut-Out fitted with Time-Limit Device (*illus.*)	803
Notes from Canada	803
Brazil: Its Present Conditions, and the Possibilities for Future Commercial Relations with Great Britain	804
Proposed Hydro-Electric Development on the River Maipo, near Santiago-de-Chile	805
Some Remarks upon London Electric Tramway Systems ...	806
Notes from India	807
Foreign and Colonial Tariffs on Electrical Goods	807
New Patents Applied For, 1911	808
Abstracts of Published Specifications	808
Contractors' Column ... ... Advertisement pages xxiv and xxvi	

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. *Established 1872.*

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGEEKAY, LONDON." Code, A B C.

Telephone Nos.: Holborn 933; Central 4425 (Editorial only).

ALL Letters should be addressed to the Proprietors, H. Alabaster, Gatehouse & Co.

ADVERTISEMENT RATES ON APPLICATION.

The "Electrical Review" is the recognised medium of the Electrical Trades, and has

BY FAR THE LARGEST CIRCULATION

of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES.—Per annum, postage inclusive, in Great Britain, 1l. 6d.; Canada, £1 1s. 8d. ($5.30). To all other countries, £1 10s.

BINDING.—Subscribers' numbers bound, including case, for 4s. each volume.

CASES.—Cloth Cases for Binding can be had, price 2s. 6d. each; post free 2s. 9d.

FOREIGN AGENTS. — New York: D. VAN NOSTRAND, 23, Murray Street. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. PARIS: BOIVEAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

Cheques and Postal Orders (on Chief Office, London) to be made payable to Mr. H. ALABASTER, 4, Ludgate Hill, E.C.

THE
UNIVERSAL ELECTRICAL DIRECTORY
(J. A. Berly's).

1912 EDITION IN PREPARATION.

H. ALABASTER, GATEHOUSE & CO.,
4, Ludgate Hill, London, E.C.

THE I.E.E. ARTICLES.

THE justice of our comments on the procedure of the Council of the Institution of Electrical Engineers, in allowing the members only one week in which to consider the proposed new Articles of Association, was amply vindicated by the proceedings at the meeting on Thursday last. From the first, it was clear that the Council realised that a mistake had been made, and that the immediate adjournment of the meeting had been resolved upon as the best way out of an awkward dilemma. The President explained that so large a number of criticisms and proposed amendments had been received, that it was impossible to proceed with the discussion profitably until these had been analysed and reduced to order, and therefore he suggested that the meeting should be adjourned to a date not earlier than November 30th, which again justifies our suggestion that a month or six weeks should have been allotted in the first instance. Some allusion was made to "precedents" in this connection; previous notices had been of one week's duration—therefore the same allowance was made on this occasion. The futility of such an argument is obvious; the whole purpose of the revision of the Articles is to *depart* from precedents—to adopt innovations and to introduce reforms. It was explained to the meeting that a Committee had been revising the Articles for two years, and that the Council had had them under consideration for nearly six months; yet one week was thought sufficient for the members to assimilate them—a striking compliment to the intellectual qualities of the members, indeed, but a somewhat backhanded one.

Before the adjournment of the formal proceedings was accepted by the meeting, several members requested the Council to give an assurance that the next special meeting should be held not in the afternoon, but at an hour which would enable members to attend it, for it was pointed out with truth that half-past four was a most inconvenient time for the majority of the members, many of whom were, in fact, completely debarred from attendance at that hour. It was also suggested that the summons to the meeting was worded in such a way that it was not legally competent for the Articles to be discussed and amended in detail, but that they would have to be accepted or rejected *en bloc*. These points appeared to have received no consideration on the part of the Council, judging from the perturbation evinced by the latter and the hurried consultations which ensued. Perhaps "precedent" was here again the culprit. Assurances were readily given in both cases, but it was impossible to resist the impression, in spite of the unfailing patience and good humour of the President, who did all that could be done to maintain harmony, that the whole affair was in a

muddle, and half-an-hour elapsed before the motion for adjournment was passed by a majority.

Representatives of the Press are not admitted to the general meetings of Corporate Members, except in their private capacity—a fact of which some members of the Council were apparently unaware—but the President consented to circulate the official report to the technical journals, and we are thus enabled to publish elsewhere in this issue a condensed account of the informal discussion which took place after the adjournment. Many of the new Articles were severely criticised, particularly those dealing with the new classification of the members and the introduction of the class of "Licentiates," and the new rates of subscription. It was suggested that the Institution was attempting to be both a scientific and a commercial body at once, a course which was impracticable. The Licentiate class is intended to include those who, while engaged in electrical engineering, are not sufficiently qualified for the class of Associate Member; the class of Associates will be reserved entirely for persons connected with the industry, who are not electrical engineers by profession. The title of the former would be spelt out in full, the initials being obviously undesirable, and it was argued that the consequence would be that the public would inevitably regard a "Licentiate I.E.E." as the highest class of electrical engineers, just as L.R.C.P. is in practice—often justly—equivalent to M.D. The Council appears to meditate the addition of non-electrical persons, not only in the class of Associates, but also in that of Members, having taken powers to admit them at discretion, and it was to this, as well as to the creation of the Licentiate class and the power to exempt candidates for Associate Membership from examination, that we referred in our last issue, as showing a tendency to lower the standard of qualification.

The most interesting item in the proceedings was the statement made by the hon. treasurer, Mr. Robert Hammond; had this been issued in the first instance with the proposed new Articles, undoubtedly there would have been far less opposition to the latter, and one or two members expressed regret that this course had not been followed. The statement was issued to members on Tuesday this week, together with the announcement that a second informal meeting will be held on the 16th inst., to discuss the suggestions received up to yesterday; but as the report of the proceedings at the first meeting appears only in the Press, obviously only those who were present and their associates will be aware that the President asked for all suggestions to be sent in by Thursday morning, and there will probably be a second crop after this week-end.

In view of the general desire that the Institution should enlarge its scope and increase its activities, we think there can be no question that in the main the new proposals deserve the favourable consideration of the members.

In certain details, undoubtedly, there is need of amendment; in particular we may point to the designation of "Licentiate," the representation of the Associate Members on the Council, the mode of election of the latter, and sundry new powers to be vested in the Council. The increase of subscription, regrettable though it be, is apparently inevitable, and it is, of course, perfectly true, as Mr. Hammond pointed out, that it was clearly foreshadowed in the last Report—though his claim that *everything* in his statement had appeared in that Report was greeted with cries of "No." While the Institutions of Civil and Mechanical Engineers receive an average subscription of £2·59 and £2·41 respectively per member, the Institution of Electrical Engineers receives only £1·76. The increasing value of membership of the I.E.E. must be taken into account in connection with this question, as well as the several new developments which are under consideration. There is much to be said in favour of a differentiation between town and country members, especially since the former have become possessed of the advantages afforded by the Institution House, which are not shared by the country members. But it is impossible for us to afford more space to the matter in this issue, and further comment must be deferred.

Co-operation. A PLEASANT little function which took place last week, and to which we allude in another part of this journal, gave rise to certain suggestions which are of considerable interest at the moment to the electrical industry. Co-operation was the plan put forward as a possible means of improving the condition of electrical trade, and there is little doubt that, short of a comprehensive financial proposition, which would sweep the various firms into one or two groups, there must be considerable advantage to be gained from some understanding both in regard to manufacturing and selling. The co-operative idea has at least the merit of simplicity; moreover, it is one which could be carried out with very little disturbance either to the financial arrangements or the *personnel* of the various companies. We do not think for a moment that it is claimed to be a new proposition, for, as a matter of fact, co-operation does exist in a very real form in the United States of America. In that country there has been a very definite understanding among the great manufacturers for a considerable time past, but, what is of equal importance, there has also been a very close relationship between the manufacturers and the traders. In this country there has been very little arrangement among the big manufacturers except the cable makers, and there never has been that support of the merchant which we consider is so desirable in the interests of the industry. The cable makers have arrived at what we think is an eminently sensible scheme to regulate prices, and they have undoubtedly gained much advantage from it, but at the same time they have not been altogether wise in neglecting the factor. The attitude of the cable maker towards the merchant is practically based on the theory that he is no better than the small wiring contractor. Surely that must have appeared to the members of the C.M.A. as somewhat illogical, for we presume that the credit of the factor is better than that of a wiring firm; not that we are for a moment suggesting anything against the integrity of the contractor, but as a rule he has to wait for his money, and in consequence his payments are somewhat slow. Here is a marked instance of the lack of co-operation, and the result is that the factor, not obtaining support from the home manufacturer, is thrown into the arms of the foreign firms, and thenceforward he helps to exploit a cable which comes from abroad. In the days of his prosperity such a procedure in no wise disturbs the cable maker, but it must not be overlooked that the electrical industry is subject to extraordinary changes, and there may yet come a time when the manufacturer will regret that he did not give more support to the man who sells.

Apart from cables, there are other directions in which it appears to us that there is ample room for co-operation. We are quite aware that there are difficulties, especially in pursuing a co-operative policy abroad. Some of the most eminent of our manufacturers have other interests, which absolutely preclude them from sending British-made articles into our Colonies and to foreign countries; but even that drawback might be met by a little readjustment and arrange-

ment. There is still a strong belief in British apparatus in many places abroad, and there is even a stronger belief in the personality of the British man of business.

As we have already indicated, the alternative to co-operation is financial control, and there are many far-seeing persons who consider that the only real solution to the problem. We are not anxious to see anything in the shape of an electrical trust, but we are quite aware of the advantages of a financial rearrangement and understanding among the larger companies. Such a reform, we think, is hardly likely to come from inside, mainly because personal feeling and prejudices would block the way; and, unfortunately, the directors of electrical manufacturing companies, with certain honourable exceptions, know next to nothing of the details of the business which they are supposed to direct. In this respect, unfortunately, the electrical industry does not differ very materially from other industries.

It would appear, therefore, that if there were to be any financial adjustments, they would have to come from outside; but, curiously enough, the electrical industry seems never to have attracted men of commanding ability and personality in the same way that have other industries, such as shipbuilding and other branches of engineering. It is, perhaps, not altogether surprising, for electrical trading is highly technical, and it has never yet had sufficient return to make it attractive to men of large affairs. Yet the financial interests involved in the manufacture of electrical machinery and appliances are very considerable. The capital invested cannot be much less than 40 millions, and this should provide an adequate field for a financier of the very highest type. Certainly, if the electrical industry had been supported by the same type of men who control shipping and iron, it would have taken its proper place among the great industries of this country, because such men could have carried the aims and ambitions of the electrical industry into the highest quarters of the land; they could have secured the recognition of Parliament, the sympathy and co-operation of the banking interests, and the sympathy and kindly interest even of the Throne. Why should not we receive the same measure of succour as the German manufacturer? The position of the electrical industry in Germany to-day is due to the remarkable support of the bankers, and to the ready co-operation of the highest in the land. The German Emperor himself, with his keen commercial insight, has recognised the enormous importance of the electrical industry in the advancement of his country, yet in no respect are our manufacturers inferior to the products of Germany, and still ours is the Cinderella of all the industries.

It is when we have pondered over these things, that we welcome any suggestion that may help to put electrical interests into the position which is their just due.

British Electrical Superannuation Fund.

The Managing Trustees of the British Electrical Superannuation Fund which was created by the British Electric Traction Co., Ltd., has just issued the actuaries' report upon the experience of the fund during the 5½ years from July 1st, 1905, to December 31st, 1910, and upon the valuation of its liabilities as at the latter date.

It may be a mixed question whether superannuation funds fulfil, on the whole, satisfactorily from the points of view of the contributors and the fund itself the requirements of adequate provision for old age. In such concerns, it may be observed, as railways, in which permanence of employment and consequent continuity of membership are the dominant characteristics, which lead to long and faithful service, they are, of course, in vogue.

The creation and organisation of such a fund by a company of the nature of the B.E.T. is an event not of frequent occurrence, and therefore of some interest. At the beginning of the period named there were 198 members of the Fund, and 184 persons entered; but eight persons died, and 122 withdrew from membership, thus leaving 252 surviving as members on December 31st, 1910. During the immediately preceding period, there were 101 withdrawals out of a total of 299 members. It will thus be seen that for such a comparatively small membership the number of withdrawals, or, in other words, the number of persons leaving the service of the companies affiliated with the fund appears, at any rate, to be significant and striking. The effect of such withdrawals is, of course, advantageous to the fund, inasmuch as the persons leaving the service of the companies which are parties to the fund *ipso facto* cease to be members of the fund, and only the sums which the persons themselves have paid into the fund are refunded to them, *i.e.*, without interest.

The fund, therefore, eventually benefits by the interest on their contributions at the expense of the persons concerned, and in addition, by the contributions which are not returnable, which the companies have paid, and are required to pay, to the fund in respect of such of their employés as join the fund, as well as by the interest thereon.

The investments appear at cost in the actuarial valuation balance-sheet at £36,794, at which sum they stand in the audited balance-sheet of the fund. No doubt they are, as is common, of the nature, and in the proportion, of each class of security prescribed by the trust deed if there be a provision to that effect. On those which were officially quoted at the date of the valuation there was, it is stated, an average depreciation of 4 per cent., the unquoted investments, which consist mainly of debentures of electric traction and lighting companies, being taken at cost; but there follows the somewhat curious statement:—"And we are assured by the secretary from his general knowledge of these securities and from the experience of the fund in similar dealings that these may throughout reasonably be taken at cost." This is open to criticism, though the actuaries have made an investment reserve fund of £1,840, being 5 per cent. upon the assets taken at cost price. It would be interesting to learn what the actual result would be if the whole of the investments were put into the hands of a broker for sale.

The valuation balance-sheet shows an estimated surplus of £379, and the actuaries state that they consider that the future prospects of the fund are satisfactory actuarially and financially, though in paragraph 12 they "see no reason why the solvency of the fund should not be maintained in future years," and they impress upon the managing trustees "that this will be largely dependent upon the proportions of members ultimately retiring on pension allowances at 60 and in later years."

It may be added that the report, to be of any service to an intelligent reader, should have been accompanied by the data and valuation tables which the actuaries have prepared, and to which they refer in paragraph 8 of their report.

Electrical Information from Abroad.

We wish to draw special attention to several articles appearing in the following pages of this issue, regarding electrical affairs in other countries. Our Indian correspondent, whose notes are, as we have good reason to know, read with great interest in various parts of India, as well as by electrical traders and engineers at home, has something to say regarding the peculiar conditions with which contractors are sometimes called upon to comply in that part of the world. A special correspondent in Chile forwards information with reference to an important hydro-electric concession which has just been granted. In view of the fact that hitherto German capital has influenced the course of many large electrical undertakings there, the writer places the notes at the disposal of British engineers, so that they may have an early opportunity of weighing up the proposition. A third matter in this issue which calls for close study is the article on the conditions prevailing in Brazil, and the opportunities which that wonderful market offers to our investors and traders. This is the first of a series of articles from the pens of two gentlemen who have spent many years in Brazil, and know their subject from practical experience. They are at present in this country, and by these articles, and in other ways, they are anxious to assist the British electrical and engineering manufacturer in strengthening his hold upon a rapidly growing market where, if their own and others' expectations are realised, there will be electrical trade to the extent of millions sterling to be done annually before many years are past.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Quartz in Electric Heaters.

Referring to the letter from Messrs. Paterson & Co. in your issue of the 27th ult., I am not concerned to discuss with them any question of credit for the introduction of the heater that is sold under my name. I may perhaps be allowed to say that, whereas I am conscious of having expended a very considerable amount of time and energy in the design and introduction of these heaters, I am not conscious of having received any assistance from Messrs. Paterson & Co., even as competitors.

What I particularly wish to point out is, that I have never met anyone who has ever seen the apparatus of which your correspondents speak, unless it be laboratory apparatus, totally unlike my heaters.

Messrs. Paterson & Co. make several statements that I do not for a moment believe could be substantiated, and it is evident that they have no idea of the large amount of quartz tubes my company is using—over 5,000 ft. a week.

This time I am out for cash and not for credit, and am quite content to accept Messrs. Paterson & Co.'s verdict that no credit for the success of my heater is due to me. It may well be due to my company's selling agents.

It was James Swinburne who said that any fool could make an invention, but it takes a clever man to work out the details, and a genius to sell it.

C. Orme Bastian.

London, E.C., *November 6th*, 1911.

The Demand for Technical Men.

Having been greatly interested in the correspondence which has lately taken place *re* the above, I have been impressed by the fact that although there have been several writers on the subject, no one seems to have made any attempt to review the cause which is dragging down all branches; I shall be glad, therefore, to be allowed to voice a point which appears, from my experience, to be a considerable factor in the case, and that is the fact that the engineers are trained in one branch, yet seek situations at the termination of their training in a difficult branch from that in which they have been trained. Take, for example, a student who, after leaving college, goes into the workshops of a good firm; he receives a fine training in the manufacture of electrical plant, the testing, and possibly the erection of it; at the termination of this he enters a central station, usually as a switchboard attendant. There he remains, and possibly he becomes a shift engineer, with the result that he has been for several years on practically routine work; he has, perhaps, only had an odd occasion or two to make use of his workshop training, and possibly, never at all; he has had no experience on top of his manufacturing training, and no experience on the outside working such as the mains, and commercial management, which are the life of the station. This man then turns his attention to trying to get back again to the manufacturing side, but either he cannot get back, or, in face of his inexperience, he has to take a very humble position in a works, and then by the time he is 30 years of age he finds himself in the position of having spent the years which should have been the foundation of his career in such a disjointed manner, that he is unable to secure a good sound job. I am of the opinion that those who are calling out against the lack of suitable men, are those who find they cannot get hold of a man who has supplemented his training by experience in the branch wherein he was trained. I don't wish to open up the old discussion as to the central station training, but will say that until engineers realise that it is necessary for the success of a trading concern that the assistants should have had that experience, we shall continue to see central stations fighting to make a profit out of a concern which would in the hands of business people be a huge success. It should be remembered that in civil engineering, which is the top branch of the engineering profession, the training includes a term in a civil engineer's office, and if one is going to make a success of his profession, he has to specialise and keep to one branch. A man trained in a borough surveyor's office would stand a poor chance of obtaining a good appointment at dock building, but it appears that a central station engineer must be trained in some other branch, and if a man is no good at the end of three years' training in a central station, then he would be no good with any other class of training, or otherwise the engineer under whom he has been is no good. Therefore, if the profession is to obtain a better wage for its servants, the engineer should receive his training in that branch which he intends to follow.

Observer.

[But that is precisely the difficulty—so ably dealt with by Mr. Cramp in his excellent address to the I.E.E. (Manchester Local Section); the student hardly ever knows with any reasonable degree of certainty in what branch of the industry he will eventually settle down. As regards central station work, we have for a long time warned the many applicants to us for advice on making a start in life, that they should avoid entering an electric generating station. No greater mistake could be made.—EDS. E.R.]

A Reliable Rectifier Wanted.

No doubt many contractors and owners of cars have experienced the want of a reliable piece of apparatus at a small outlay for charging one or two ignition accumulators for motor-car work off an alternating-current supply. It is surprising what a number of such outfits have been put on the market by firms of repute and have been afterwards gradually withdrawn, owing to their unreliability. An outlay of £10 or £15 for a motor-generator set, regulating resistance and ammeter is usually out of the question.

All the electrolytic valves and rectifiers of the "Batten" type that I have had experience with have proved unreliable under working conditions, and if any of your readers can assist me by informing me of any really satisfactory arrangement on the market, I shall be very much obliged, and I am confident many others will be pleased to hear of the same.

J. R.

The Institution of Electrical Engineers.

Having secured the adjournment of last Thursday's extraordinary general meeting of the Institution of Electrical Engineers, it is necessary for those who are not satisfied with the proposed changes in the articles of association to take concerted action for their amendment. It seems desirable to direct attention only to the main alterations which would be produced by the new articles, as, if amendments of principle can be secured, the minor amendments of detail which they would necessitate could be left in the hands of the Council. It is to be hoped that the procedure at the adjourned meeting will be arranged to allow this course to be adopted, as no advantage can be gained by wasting the time of the meeting discussing and voting upon a multitude of minor amendments which are simply dependent on the decision reached regarding the points of importance.

The first question is that raised by Articles 4 to 17, covering the qualifications for membership. Broadly, the effect of these articles is to increase the existing tendency for the Institution to become more a trade association and less a professional body. To check this it is necessary to modify Sections C and D of Article 12 which govern the admission of non-professional men to full membership, and to insist on the deletion of Article 15, which creates the new class of "licentiates." Apart from the name (which is a minor matter), there seems to be no need for this class, as those eligible for it fall naturally into one or other of the existing classes—students, associates or associate members. The addition of more classes is, in itself, most objectionable for two more or less opposed reasons.

On the one hand, it involves labelling members with a title indicating their qualifications too minutely, and, on the other hand, it can only tend to the complete loss of the value

of all our Institution titles in the eyes of a public which cannot be expected to appreciate the fine distinctions which may be apparent to members of the profession.

The next series of important changes are in Articles 26 to 40 dealing with subscriptions, &c. It is to be presumed that the Council will satisfy existing members that the Institution has the legal right to increase their subscriptions, and it is to be hoped that they will publish a financial statement showing the necessity for the increase, giving particulars of the additional income anticipated, and the manner in which it is proposed to expend it. Many of us feel that the subscriptions which we now pay are greater than is warranted by the advantages we enjoy, and the least that can be expected, if we are asked for more, is that necessity should be clearly proved. In this connection, it may be remarked that no such necessity was shown by the last annual report of the Council, and that one of the reasons there given for an increase in subscriptions—that it would raise the prestige of the Institution—shows a complete failure to grasp the meaning of prestige in a professional body. Apart from these points the alteration in the rates for compounding needs explanation; this alteration implies that the old rates were on an unsound financial basis, in which case it is remarkable that existing members are asked to increase their subscriptions, but existing members who have compounded are not called on to pay the difference between the old and new compositions. The most important point in connection with the subscription rate is, however, that there should be discrimination between town and country members. Mr. Hammond's contention last Thursday that the existence of the local sections obviates this necessity cannot be maintained in the face of the acquisition of the Institution building, however plausible it may have been when we had no proper home of our own. Feeling on this question is strong amongst provincial members, and it will be difficult for the Council to justify the increase to them, however successful they may be with town members.

Finally, we come to Articles 44-54, dealing with the composition and election of the Council. As regards the composition, it need only be remarked that the non-corporate associates are over represented, and that the proportion between associate members and associates on the Council should be 4 to 2 or even 5 to 1 instead of three of each. The methods proposed for the election of the Council were stated by Mr. Hammond on Thursday to be intended to make the election more democratic, but actually can hardly fail to have exactly the opposite effect and to lead to the Council becoming entirely co-opted. The opportunity to nominate candidates *after* the publication of the list of the Council's nominees should be restored, and the provision in Article 49 that under any circumstances 50 per cent. of the new councillors shall be the nominees of the old Council should be deleted. It would be advantageous to provide that the Council's nominees shall exceed the number of vacancies so that there would necessarily be a ballot, and the nomination of other candidates would be less invidious. Very great importance attaches to the question of the election of Council if members wish to retain a real control of the Institution, the more so in view of Articles 66 and and 69 (if these are allowed to stand), the first providing that the Council can effect loans, and the second that they can incorporate kindred societies without sanction by a general meeting.

I can only plead the importance of the subject as an excuse for so long a letter, and in conclusion would repeat that concerted action must be taken at once if these articles are not to be adopted unamended. It is very greatly to be regretted that the Council did not submit a draft to all members and invite criticism and amendment some months before they proposed the formal submission of the articles to a general meeting. Radical changes should not be made without the *considered* support of the majority of members, and three years' deliberation of a committee sitting in private is no substitute for open discussion. It is unfortunate if the method actually adopted by the Council forces on some of us a course apparently directly hostile to their proposals, but the blame for this result cannot be laid at our doors.

Maurice Solomon.

Birmingham.

The alarm with which the proposed new articles of association of the Institution of Electrical Engineers have been received by the members all over the country, and the informal discussion in London, have proved that there is a wide difference of opinion between the Council and the general body of members. The Council have agreed to an open discussion, which no doubt will result in a large number of amendments being sent in. As, however, hundreds, and possibly thousands of amendments cannot be taken into consideration, the purpose of the deferred discussion will be frustrated unless some definite method is adopted beforehand to reduce the number of amendments to the vital points only, leaving matters of detail to be put at the meeting in London.

As points affecting the future policy of the Institution, on which a vote should be given, I would propose the following:—

1. Inadvisability of creating the new class of Licentiates. (Par. 4.)
2. Necessity of keeping the Institution a strictly scientific and professional body. (Par. 12D.)
3. Increase of fees. (Pars. 26 and 27.)
4. Examinations. (Par. 16.)
5. Nomination and election of Council. (Pars. 49, 51 and 52.)

Under the present by-laws the Local Sections have no power to vote or pass any resolution in respect to the affairs of the Institution, and, therefore, whatever votes are taken will have to be forwarded direct from the members to the secretary. In order to enable any member to gauge the strength and the direction of the opinion of the body of members, I would suggest that copies of the resolutions passed on the above points should be published in the technical Press, together with the number of the members in favour.

R. Orsettich, M.I.E.E.

Birmingham,
November 6th, 1911.

PROCEEDINGS OF INSTITUTIONS.

Recent Developments in the Manufacture of Incandescent Electric Lamps.

By J. E. Randall.

(*Abstract of paper read before the* Illuminating Engineering Society, *Chicago, September*, 1911.)

Lamps with carbon filaments have been supplied without any change in appearance for over 11 years. Within that period one notable improvement was introduced, namely, the metallised filament.

No changes have been made in the processes of manufacture. The best lamps of 10 years ago were as good as the best of the present year. The average has arisen due to the elimination of defectives.

All conditions favourable to advancement of the regular carbon-filament lamps were of similar assistance to the Gems. A discovery in connection with the preparation of the carbons for these lamps resulted in a decided improvement in 1909. Heretofore, wattages lower than 50 had not been made successfully. Recent experiments show that wattages as low as 30 can be made. The Gem lamp shows a sufficient superiority in quality over the regular carbon-filament lamp to justify its more extensive use.

The osmium lamp marks the beginning of development of metal-filament lamps. It reached a successful commercial stage in Europe.

The tantalum, nearly coeval with the osmium, is worthy of mention as an example of an article upon whose production years of research had been spent, and upon whose design lavish experiments had been made. When first offered to the public, its design was finished and its qualities were thoroughly known.

This lamp was the first real drawn-wire lamp, and its development required a construction of the filament supporting element different from any that had been used heretofore. The same design has been followed, with slight modifications, in the drawn-wire tungsten filament lamp.

The superiority of the metal tungsten for a lamp filament was immediately recognised because of its extremely high melting point. The brittleness of the pressed filament, especially when it is cool, has been a serious drawback to the general use of the lamp. The attachment of the filament rigidly to the circuit connections and to the intermediate connections between the filaments has probably been the chief cause of filament breakage in these lamps. The arced joint, while it was perfect electrically and

mechanically, held the filament ends rigidly. Any jar to the lamp tended to make the filament vibrate and usually to break close to the joint. The schemes that were devised for avoiding this filament breakage were legion, but the author believes he is safe in saying that the loose contact at the bend of the filament, with a support that was rigid, made the hardiest lamp of the pressed filament type.

One of the most successful devices for preventing the breakage of filaments was that of introducing a short piece of piano wire between the centre rod and the stem seal. This supported the filament structure with remarkable flexibility and prevented breakage from blows on the lamp in almost any direction. A slight blow upon the base of the lamp was invariably fatal, and this one weak feature served to prevent the general introduction of this method of support.

The pressed tungsten filament is not ductile when cold, no matter by what process it may have been produced. It was natural, therefore, that immediate effort should be made to develop a quality of tungsten sufficiently ductile to be wrought into the form of wire, and in 1911 ductile tungsten has been produced on an extensive commercial scale.

It is generally believed that the presence of carbon in tungsten is the cause of its brittleness. One well known process for making pressed tungsten filaments does not involve the use of carbon, yet filaments produced by this process are as brittle as are filaments made by the use of carbon. As a matter of fact, the best pressed tungsten filaments have been those made by processes involving the use of carbon, yet they contain an amount of carbon so small that it can only be detected by the most delicate tests. For instance, filaments which are known to contain less than 0·005 per cent. carbon are no more ductile than those which are found to contain 0·1 per cent. The elimination of carbon tended to reduce the length shrinkage of filaments when lamps were burned. Filaments produced in 1908 and 1909 sagged excessively, and the filaments often short-circuited due to this sag; the slack producing this sag was necessary because of the filament shrinkage. During the year 1909 decided improvements were made in this respect, and the basis of these improvements was the more complete elimination of carbon from the tungsten filament.

Progress during 1909 and 1910 did not indicate a material decrease in the fragility of the pressed filament. It was evident, therefore, that to make the tungsten-filament lamp a universal lamp, it would be necessary to have the filament in the form of wire which was sufficiently ductile to be wound, when cold, upon a spider structure. The drawn tungsten wire has met this need. While the wire before being placed in the lamp is amply ductile for the purpose of winding upon the spider and for all other manipulations needed in making the lamp, it loses much of this ductility when current is passed through it in a vacuum. The methods of supporting the wire on the spider, and of attaching it to the circuit terminals are, therefore, important factors in the hardiness of the lamp.

The wire may be considered to consist of pure tungsten. Chemical analysis does not find other elements. The ratio of resistance hot to resistance cold is as high as can be found in any other form of the metal. The specific gravity is higher than that found for the pressed filament. The current and the candle-power peaks are low.

The structure of the metal appears to be fibrous. It changes to the crystalline form during the burning life of the lamp. This change may occur in some portions of a filament and not in others. Frequently, after the full burning life, small sections of filaments will be found that show ductility.

Tests indicate that the wire is less brittle at every stage in the life of a lamp than are pressed filaments. The surface is the same in appearance, after the lamp has been burned, as that of a pressed filament. It looks as if the wire had been cracked into irregular pieces, and as if a cement of the same material had filled up the cracks. No fissures at the surface and no cavities in the body have been found.

While the wire, before being placed in the lamp, may be ranked with the toughest steel in tensile strength, ductility and elasticity, the decay of these properties after it is in the lamp makes it necessary to handle these lamps with reasonable care in order to prevent breakage. Breakage in transportation and handling compares with that for carbon-filament lamps.

Another feature in which the drawn wire is superior is the wide range of sizes suitable for use. A piece of wire may be drawn to a size suitable for a 6·6-ampere series-burning lamp, or it may be drawn to a size suitable for a 20-watt 110-volt multiple lamp. It will, when drawn to the proper diameter, be equally satisfactory for the largest or the smallest lamp. In addition, the wire may be shaped into helices, spirals or zig-zags; thereby concentrating the light-giving element into a small volume. The latest automobile lamp is an example.

The number of contacts between the filament and supports, including terminals, as well as the size and material of these supports, will affect the performance and physical hardness of a lamp.

The following results were secured from three series of tests in each of which more than 300 drawn-wire tungsten-filament lamps were used:—

Number of contacts	11	13	15
Comparative strength, by pendulum test—			
Copper	91·5	100	96·5
Molybdenum	—	—	93·0
Comparative performance at normal efficiency—			
Copper	99·4	100	96·1
Comparative life at extreme temperature—			
Copper	107·0	100	87
Molybdenum	—	—	103

The lamps were standard in voltage and all were 40 watts. They were identical except in the number of filament contacts. The results of the first and second tests confirm one another in indicating that 13 contacts are most satisfactory.

While no record is shown for molybdenum-support lamps at normal efficiency, such lamps were tested, but their performance was much poorer than the corresponding copper support lamps.

The comparative lives at extreme temperature show that 11 contacts are better than 13, and that 13 are better than 15. Also that 15 molybdenum contacts are better than 13 copper, but inferior to 11 copper. These results are not in consonance with the results at normal efficiency. It is reasonable to believe that tests at, or near, normal efficiency indicate more accurately the behaviour of lamps in service than do those at high temperatures. It has been observed that the wire in lamps burned out when at high temperature remains more ductile than the wire in lamps burned out at normal temperatures. The early failure of 15-contact lamps would not be explained by mechanical weakness. The wires usually "burned out," or melted, between the supports. The melting of the wire at the point of highest temperature has really controlled the life record of this test. The diameter of all copper supports was the same. The diameter of the molybdenum was 40 per cent. of that of the copper. Supports of copper having diameters 30 per cent. smaller and 30 per cent. larger than the size used in the above tests both showed a lower strength by pendulum test. The author cannot explain why this should be so, but the tests were convincing.

If progress in lamp development may be gauged by the highest filament temperature at which each new lamp will show a given performance, one has a rational measure. For example, if 90 per cent. of the theoretical candle-power hours are developed in 1,000 hours' burning, candle maintenance and mortality both considered, the advance from the raw carbon-filament lamp so the tungsten-filament lamp will show something as follows:—

Raw carbon-filament lamp (cellulose carbon) ...	100
Treated carbon-filament lamp	119
Metallised carbon-filament lamp	149
Tantalum-filament lamp	206
Osmium-filament lamp	270
Tungsten-filament lamp...	359

This comparison excludes many items, and is not a comparison of commercial values, although it is a comparison of the most important element in commercial values, namely, the energy wasted in doing equal work.

The Institution of Electrical Engineers.

The Proposed New Articles of Association.

Limitations of space preclude the publication here of the proposed Articles, but the following are the principal modifications:—

The membership is divided into two sections: Corporate Members, comprising Honorary Members, Members and Associate Members; and Non-Corporate Members, comprising Associates, Licentiates and Students. "Foreign Members" no longer appear as a separate class.

The abbreviated titles of Corporate Members are unchanged; the distinctive titles of Non-Corporate Members are given in full, followed by the letters I.E.E.

The qualifications of Members are verbally altered, but not materially varied, except that temporary unemployment is not to be deemed a disqualification, and that gaining the senior premium for a paper no longer constitutes sufficient qualification for the transfer of an Associate Member. The admission of "persons of eminence" who are not electrical engineers by profession is further provided for, with limitations to the number of such members.

The qualifications of Associate Members are similarly modified; the gaining of a premium no longer qualifies an Associate for transfer to this class. "The Council may require candidates for Associate Membership to pass an examination, or in their discretion grant exemption therefrom in approved cases."

Associates are to be persons of good education who are not electrical engineers by profession, but, in the opinion of the Council, are so connected with the applications of electricity that their admission as Associates would conduce to the interests of the Institution.

Licentiates are to be at least 23 years of age and of good education, either electrical engineers by profession or employed in an engineering or scientific capacity in the applications of electricity, whose admission as such would, in the opinion of the Council, conduce to the interests of the Institution.

Students are to be not more than 23 years of age when elected, and are to be either students of electrical engineering at one of the universities, colleges or schools recognised by the Council; or pupils, apprentices or assistants under agreement under a corporate member; or persons trained as electrical engineers and employed in positions of minor responsibility. The Council may require them to pass an examination, or, in their discretion, exempt them therefrom.

Proposals submitted to the Council for transfer from one class to another are in future, if approved, to be presented for ballot as in the case of new members.

The entrance fees are raised as follows: Members, 3 to 5 guineas; Associate Members and Associates, 2 to 3 guineas; Licentiates will pay 1 guinea.

Subscriptions are raised as follows: Members, 3 to 4 guineas; Associate Members admitted to that class after December 31st, 1911, 2 to 3 guineas; ditto, before that date, 2 to 2½ guineas; Associates,

the same as Associate Members; Licentiates will pay 2 guineas, and Students up to 19 years of age, 1 guinea; above that age, 1½ guineas. Members residing abroad, on the register at December 31st, will pay 3 guineas (formerly 2 guineas, and Foreign Members £1). Associate Members and Associates residing abroad pay the same as at home.

Life compositions formerly cost 40 guineas for all classes but students; in future any member (not a student) may compound for his annual subscription by the payment of 20 times the annual subscription, subject to deductions for subscriptions already paid, as before.

A new article embodies rules for "Professional conduct," similar to those adopted by the Institution of Civil Engineers, breaches of which will be dealt with by expulsion, or as the Council may think fit.

The constitution of the Council is modified by the omission of the President-Elect, and the addition of the immediate Past-Chairman of each Local Section. Of the 18 ordinary members of Council, 12 are to be Members, three Associate Members and three Associates.

Prior to March 1st, any 25 Corporate Members may nominate duly qualified persons to fill vacancies about to occur in the Council on September 30th; at least four weeks before the annual general meeting the Council must present a list of persons nominated by them, and if any other persons have been nominated, a ballot list, showing which are nominated by the Council and which from outside, is to be sent to the Corporate Members and Associates at least seven days before the annual general meeting. The number of names selected from the list must not exceed or be less than the number requisite to fill the vacancies. The persons elected take office on October 1st.

Provision is made for holding examinations to test the qualifications of candidates for election or transfer, and for the payment of fees by the candidates.

The Council is empowered to arrange for informal meetings and lectures for the dissemination of electrical knowledge.

Power is taken for the Council to borrow moneys for the purposes of the Institution on the security of its property.

The Council may appoint committees for special purposes, and delegate to them any of its own powers.

No report of the proceedings at any meeting may be taken or published without the consent of the Council.

An extraordinary general meeting of members was held at the Institution House on Thursday last week, to consider the proposed new Articles of Association.

Mr. S. Z. de Ferranti, the President, was in the chair, and after the notice convening the meeting had been read, stated that the Council had received from many directions a number of inquiries and suggestions regarding the proposed new Articles. The Council believed that the amended Articles were in every way good from the point of view of the interests of the Institution, but they thought a mistake had been made through following the ordinary formal practice by making the time too short to enable proper consideration of the Articles to be given them by a number of members; he, therefore, proposed the adjournment of the meeting so as to give time for very full consideration of the Articles, to a date not earlier than November 30th. Mr. Hammond having seconded the motion, the President said he would now put it to the meeting, when Mr. A. J. Makower suggested that if possible the time of the meeting should not be half-past four in the afternoon, but at 8 o'clock.

Mr. F. C. Raphael asked leave to move an amendment to the resolution, pointing out that if the meeting were adjourned and the notice of the next meeting issued in the same terms as the notice of that meeting, the Articles would have to be discussed *en bloc*, and no amendments could be proposed, the members not having had seven days' notice of them as required by the Companies' Act.

Mr. Hammond said he thought provision could be made so that that difficulty would not arise.

Mr. Raphael remarked that the Provincial Members and Associate Members were desirous of having a great many amendments made in the Articles, and asked for an assurance that steps would be taken so that these amendments should be in order, and might be discussed; in the absence of this assurance, he thought they ought not to permit the meeting to be adjourned without a much fuller discussion than was presumably intended, from the President's opening remarks.

Mr. A. Siemens pointed out that, after the adjournment of the formal meeting, those present could talk over the proposed Articles, and there would be plenty of time before the new meeting for members to send in their amendments to the Council, which could be put into the notice of the new meeting, if necessary. The Council acknowledged that the present notice had been too short for such an important resolution, and wished to prolong it in this way.

In reply to Mr. Makower, the President explained that the Council wanted the fullest discussion of the proposals at the informal meeting which would follow the adjournment of the formal meeting.

Mr. Maurice Solomon said that if the motion of adjournment were passed, anything decided at the informal meeting would not carry any weight.

The President, to illustrate the impossibility of proceeding with the discussion, pointed out that one member alone had sent in 27 amendments. If all the material were sent in, there would be plenty of time to reduce the amendments to a workable form—otherwise the whole time of the members would be taken up with these questions alone.

Mr. Morse said that any amendment that could be put at that meeting could be put at the adjourned meeting. If there were amendments which, in the opinion of the Council and members, were desirable, what was necessary to make those amendments legal should be done. The object of the informal discussion was to come to a consensus of opinion on both sides of the table.

Mr. Makower again asked for an assurance that the time chosen for the meeting should be one at which the younger members could attend.

Mr. A. J. Cridge pointed out that, if they resolved themselves into an informal meeting, no report would be presented of the proceedings, and Mr. A. P. O'Brien said the afternoon meeting was inconvenient to the older as well as to the younger members.

Mr. A. H. Dykes supported the proposal to adjourn and hold an informal meeting, after which members who had points to put forward could send them in to the secretary, and the amendments could be sorted and discussed at the next meeting; the hon. solicitors could arrange that whatever was decided at that meeting could be confirmed at a later meeting.

Mr. Makower asked what advantage would be gained by adjourning first and discussing the proposals afterwards?

The President explained that the members generally suggested that they had not anything like enough information, and therefore they could not properly vote upon the Articles. There appeared to be no objection to holding the meeting at 8 o'clock. The remarks of the members present would be reported, and from that point of view it made no difference whether the discussion was formal or informal. They wanted to get the views also of those who were not present.

Mr. F. C. Raphael pointed out that the meeting was not open to the Press, and asked that the shorthand notes of the official reporter should be placed at the disposal of the Press.

The President, in reply, said that they wished to give the meeting the widest publicity possible, and would like to see the matter appear in the Press, so that it should reach all the members of the Institution. The shorthand report would, therefore, be at the disposal of the Press.

Mr. M. Solomon was pointing out that the offer to adjourn the meeting did not really meet the difficulties which they had come up expressly to try and deal with, when Mr. Hammond, rising to a point of order, said that at meetings of companies a person could only speak once on the motion or the amendment, and that if a member were at liberty to speak as many times as he liked, they would never get the meeting through.—The President agreed as to the rule, but Mr. A. Campbell, supported by Prof. Mather, said that that had not been the custom at the meetings; people had been able to speak more than once if the meeting wished to hear them.

Mr. Solomon asked if he were in order, but the President said that it would be impossible to conduct the business in that way. The Council, like the members, wished to do the best they could for the Institution, and the simplest thing to do, if they wished to give the Council the benefit of their advice, was to adjourn the meeting, and then to remain to hear those things which were most to the point in the interests of the Institution. He then put the question, and the resolution was carried by a majority.

The President said the two outstanding questions in these Articles were, first, the amount of the subscriptions; and, secondly, the re-arrangement of the membership. Small changes of wording or arrangement could not have very much effect on the prosperity and usefulness of the Institution. With regard to the subscriptions, he came there mainly to see what could be done to bring the Institution more into touch with the needs of the industry, to increase the prosperity of electrical work, and to extend the applications of electricity, and to do various things for the good of the members. The difficulty which he met at every turn was that there was no money to spare for any such purpose. They could not get results without paying for them. Regarding the alteration of membership, he was largely responsible for pressing the idea that the Institution wanted to be not only a scientific society, but a body which dealt generally with the whole wide interests of electrical work in this country. The only body that could really represent electrical interests was that Institution, which should, therefore, put itself into such a form that it could be really useful to the interests of all concerned in electrical work. Therefore, it was desirable not to limit the membership to purely technical people; they wanted to bring in many able men who were not purely electrical engineers, and to get them to help in conducting this business. The question of naming the various classes had been the most difficult thing he had ever come across in all his experience; after months of meetings it would be very hard to find anything that would meet the case more satisfactorily than what the Council had put forward. He called upon Mr. Hammond to speak first, as the chairman of the Articles Committee, which had discussed the Articles for 18 months.

Mr. Hammond made a lengthy statements as to the necessity for the revision of the Articles and for the new proposals. Two years ago a Committee was appointed with instructions to re-arrange and revise the Articles; it consisted of 12 members, including the six chairmen of the Local Sections. After 18 months' work the new Articles were submitted to the Council, which had since then made a careful study of them. It was, therefore, not a hurried piece of work. The importance of raising the standard of qualifications of Members and Associate Members had been a guiding principle, and the Council had decided to adopt examinations for this purpose. The Licentiate class was introduced to provide for the admission of men who, while engaged in electrical engineering, could not pass the examination for Associate Membership; formerly these could enter the Associate class, but this class consisted largely of gentlemen of high standing in other professions, for whom it should be entirely reserved. Much

difficulty had been met with in finding a suitable title for the new class, and "Licentiate" was chosen for want of a better name. It was already used by the Royal Institute of Architects for a similar purpose. Those Associates who were qualified as Associate Members would be transferred to that class, the Associate class becoming an absolutely non-electrical class, not holding the rank of Corporate membership. The terms of admission to the class of Member had been modified, and the constitution of the Council revised, giving direct representation to the Associates, securing the introduction of new members, and providing for the better representation of the Local Sections. The mode of election of the Council had also been changed to facilitate outside nominations. Regarding the increase of subscriptions, the acquisition of that building had added to the dignity conferred by membership of the Institution, though it did not necessitate an increase of subscriptions *per se*. But they were working on a small margin, and if the upper part of the building were not let to new tenants in June next, a liability of about £3,000 per annum would be incurred. To provide against this a number of past and present Members of Council had formed a guarantee fund of over £7,500, which could be drawn upon, if necessary, by way of loans repayable when convenient to the Institution. However, they were not asking for increased subscriptions because they could not pay their way, but because, being in possession of the Institution Building, they could now carry out various new developments which hitherto had been impracticable. The building was used by some 13 kindred societies. It had been proposed to issue the *Journal* monthly, to inaugurate lectures by specialists, to hold summer meetings, to open an employment bureau, to supply technical and commercial information to individual members, and to start a lending library, but all these things required additional funds. The expenditure on the staff was extremely low, but additions to the staff were imperatively necessary. The proposed new rates were equal to, or less than, those of the other engineering bodies. It was estimated that the matters under consideration would necessitate an additional expenditure of almost £2,000 capital, and over £2,000 per annum, if carried out in full. Six months ago the Council embodied in the Annual Report everything that he had told them that day in respect of their desire to enlarge the scope of the Institution, and foreshadowed the increase in subscriptions and entrance fees.

Mr. Solomon expressed the thanks of the members to the President and Mr. Hammond for the exposition which had been put before them; he said it was one of their great regrets that some such exposition was not sent out with the notice of the meeting. The Articles raised very vital questions in the life and future of the Institution; the Committee had sat for three years on the subject, so they would conclude that there was another side of the case, and it was vital that both sides should be fully discussed before they came to a decision. He referred particularly to the Articles dealing with the qualifications of membership; there were to his mind—and he believed he voiced the opinion of a good many—two objections to them. The first was that they did not want a new class of members, because they did not want their Institution to be split into so many classes and divisions, each labelled with specified qualifications; the Institution should be more catholic and draw all distinctions between two or three classes and not more. Further, there were two ideals before them; they could endeavour to make themselves a purely professional Institution, or an Association of all interested or concerned in the electrical industry. But they could not do both. He thought the Council was endeavouring by these new qualifications to do both, and such a policy was destined to failure. As a professional Institution they wanted three classes of members—Members who were at the top of their profession; Associate Members, the great average of the people in the profession—both these classes being strictly professional men; and Associates, which should include all the non-technical men. The alternative was to broaden their scope, and in that case they wanted two classes—Members, including the most distinguished people, whether technical or non-technical, and Associate Members, which should include the remainder whether technical or non-technical. The Institution should make up its mind which of those ideals it wanted to follow, and then draw up its classification accordingly. He would not then argue whether one way or the other was the better. Regarding the question of fees, Mr. Hammond had made a statement of the reason for the increase in which not one figure had been put before them. If they were to be asked to raise their subscriptions they ought to be shown in £ s. d. what the additional income was to be used for. As a local member he voiced the feeling of country members that if any alteration of subscription were made, consideration should be shown for the fact that the country members could not enjoy the same advantages as town members, and some difference should be made in the subscriptions, to allow for the fact that that palatial Institution was of no practical use to the former. Turning to the election of the Council, provision had been made for increasing the representation of the Associates, who, however, had no vote in the affairs of the Institution. Why were they given a representation on the Council equal to that of the Associate Members? In future, it appeared, the new members of the Council would be nominated by the Council, and in practice, though not in theory, outsiders would get no chance of nominating new Councillors, seeing that they had to give notice three months beforehand, and that after the Council's list of nominees had been produced, outsiders could not propose fresh men, as they could under the old rules. That was a very valuable privilege and ought to be restored. The Local Sections and individual members were very anxious to propose amendments, and in Birmingham, on Tuesday, a meeting was hastily called and well attended, which sent in a resolution asking the Council to submit the Articles for discussion at the local centres; he hoped the Council would accede to that resolution, which he had with him, and which was signed by most of the leading members of the Birmingham Section. He understood that similar resolutions had been sent in from many of the other branches. He did not want the mistake to be repeated, of calling a meeting to discuss Articles without the amendments also being before them.

Mr. W. Cramp asked whether it would be in order for the Local Sections to call their Committees or the whole section together to discuss the Articles, and to forward the necessary amendments by the date mentioned.

Mr. E. H. Rayner suggested that an explanatory letter should be circulated to the members, dealing with the effect of the alterations in the wording of the Articles, and giving a review of the present and future financial situation. It would be a great advantage to have a *résumé* of the treasurer's statement circulated to all the members, especially to the local meetings which might be held. Referring to the composition for life membership, in the past members had paid three guineas yearly, and the composition fee had been 40 guineas—13⅓ years' purchase—which he considered a very proper sum. Under the new regulations that sum would be raised to 80 guineas, or 20 years' purchase of the increased subscription, which seemed excessive.

Mr. A. Campbell said there was no doubt whatever that the change of subscription touched very directly, and sometimes very acutely, every member of every branch, and it seemed to him, so far as he had talked to members, that every member would be desirous of expressing his opinion on the matter. No doubt a great deal could be done with a great deal more money, but he suggested that when it came to the final decision of this financial matter a referendum should be taken of the members of all classes. They were all very thankful to the past and present Councils and Presidents for that magnificent building and really delightful library; that was a very great advance, and they must not go ahead too quickly after it. The Associate Members and the Associates formed the backbone—in numbers at least—of the Institution, and remembering that very probably the average income of the members of that class was between £150 and £200 a year, he thought it was not desirable to ask more than two guineas a year from them, especially as many of them had to belong to another society as well. As it was a matter which acutely concerned all who were asked to subscribe, it should not be decided by a vote of those who came into that room, which did not represent the whole of the membership, but by a direct referendum.

Mr. F. C. Raphael said he cordially agreed with the general principle of the alteration of the Articles—to enroll every useful member of the Institution; if an increase of subscription was necessary, they must pay it. He would like to ask Mr. Hammond why the Associate Members had only one representative on the Council, while there were 2,809 Associate Members to 1,331 Members, a majority of more than two to one. Mr. Hammond had said that in the report of the Council they had full notice of practically the whole of the provisions put forward in the proposed amendment of the Articles; was there any mention of the proposal to have an absolutely new class of members, to make a very serious alteration in the method of electing the Council, to give the Council powers to delegate its own powers to non-members of the Council? All these things were included in the proposed new Articles. The Council also took powers to incorporate any other association whatever with their own, without seeking the permission of the members. These should not be things of which only a week's notice was given, and that notice should not be given in such a way that one concluded it was the first thought of the Council that the new Articles could be accepted *en bloc*, without opportunity for discussion. Speaking as an Associate Member, he said it was now proposed to increase the class of Associates by as many good members who were not electrical engineers as possible, and to form a new class called "Licentiates," electrical engineers who were quite unqualified to be Associates, and certainly could not be licensed to practice as the word "Licentiate" obviously implied. He suggested that the "Licentiates" should be called "Subscribers," a name which met the case very well; they subscribed to the funds, but had practically no qualifications, and as they did not want to have such an abbreviated title as the initials of "Licentiate of the Institution of Electrical Engineers," obviously they must write the word "Licentiate" in full. Again, if they were to have a large number of new Associates, obviously the position of the Associate Members would be prejudiced. To the general public there was very little difference between Associate and Associate Member. He proposed that Associates should be called "Affiliated Members." (The President pointed out that the word "affiliated" had very painful associations.) Dealing with the representation on the Council, Mr. Raphael proposed that there should be not three Associate Members and three Associates on the Council, but four of the former and two of the latter; he hoped this proposal, at least, would be accepted. The election of the Council had already been referred to; the effect would be that the Council would nominate its successors. That was not the position in any other Institution, and he felt it was due to an error in drafting.

Mr. W. R. Cooper said he hoped a statement would be made to the members showing why the increase of subscription was necessary, and referred to Mr. Mordey's statement, when it was decided to take over that building, that no increase of subscription would be necessary. Would it not be possible to raise the subscriptions merely of new members, and to make a distinction between country and town members, as was done by the Civil Engineers? Associate Members did not transfer to the class of members as they ought to, and if the subscription were put up, that feature would become still more marked. He agreed with the criticism directed against the Licentiate class; he was afraid the public would esteem Licentiates more highly than the full members, and once they got

into that class they would stick in it for the rest of their lives. It ought to be a migratory class, and after a certain number of years their subscriptions should be made equal to that of the Associate Members, so as to make the Licentiates transfer to the higher class. As regarded students, the term "Graduate" would be more suitable, as used by the Mechanical Engineers. The election of members at meetings of the Institution was an absolute absurdity; would it not be better to do away with them altogether? He agreed that the Associate Members should have a larger representation on the Council, say, four to two, and felt that the proposed system of outside nominations was too cumbersome and would fall into disuse. The use of the word "present" in Article 57 was most ambiguous, and the word ought to be deleted. He asked the Council to give an indication of their policy with regard to the reports of meetings, and suggested that it would be better to have another informal meeting before the formal meeting on November 30th for further discussion.

Mr. A. P. O'Brien supported the remarks of Mr. Campbell and others as regarded the subscription of Associate Members, and asked how the increased amounts were to be applied. The Licentiate class was not very necessary, in view of the wide provisions made for Associates.

Mr. T. H. Roberts-Wray said the most vexed question seemed to be that of subscriptions. He thought that, legally, they could not increase them without obtaining the consensus of opinion of everybody who would have to pay them.

Mr. A. J. Makower said that if they charged 80 guineas for compounding for a 4-guinea subscription, it meant at 5 per cent. compound interest that the expectation of membership was an infinite number of years. The old rate was not 13 years, but 22 years at 5 per cent. A more reasonable figure than the one suggested would be 50 guineas, or about 20 years' purchase.

Mr. A. A. C. Swinton supported Mr. Cooper's suggestion that another informal meeting should be held.

Mr. A. H. Preece thought that probably the new Articles would eventually be accepted *in toto*, but it was an unfortunate mistake on the part of the Council to hurry it too much. The excellent statement given to them on entering the room should have been in their hands a week ago; it ought to be sent out to all the members, and the amendments received should be sorted and posted up in the Library. An estimate of the future income and expenditure should be issued to the members. He thought that the members did not want to be "bluffed," but that, when they got hold of the facts, they would support the Council as they had always done in the past.

Mr Hammond, repairing an omission from his previous remarks, said the Council took the view that, as the majority of the country members resided within the area of one of the Local Sections, and a money grant was made annually to each Local Section, which, with travelling and printing expenses, brought up the total expenditure on Local Sections to more than *one-third* of the subscriptions of their members, it would be fair to fix the subscription at the same figure all round. The subscriptions of the bulk of the existing membership, namely, Associate Members, Associates and Students, will be the same as those of the Mechanical Engineers and of the country members of the Civil Engineers.

The President said that another meeting would be held at 8 o'clock in the evening of that day fortnight, and asked the members to forward suggestions by that day week (Nov. 9th), to give time for them to be sifted. By then they would have an immense mass of information. Before that meeting they proposed to send out the statement showing the principal alterations, and Mr. Hammond's explanations of the Council's reasons for the different changes made.

In reply to various questions, the President said that the report of the meeting would be furnished to the technical papers, and that the suggestions from the Local Sections and other sources would be placed before the meeting to be held that day fortnight, but these would not be sent out to every member. All members were requested to send in their suggestions in writing.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"Inquirer" writes: "(1) Assuming an installation is carried out in a good practical manner with the general quality of materials and fittings, and the same passes the tests of the Corporation Electricity Supply Department, has the Corporation any authority to reject the installation and refuse to connect the supply to same?

"(2) Has a Corporation any powers or authority to dictate to a contractor the kind or quality of wires, cables, flexible cords, cut-outs, wall-plugs and fittings, generally, to be used on its supply on private consumers' premises?

"The reason for asking these questions is because, at the present time, the contractors in this town are being dictated to as to what they shall and shall not use, irrespective of any tests.

"The requests of the Corporation have, up till now, been very well met in reference to flexible cords and cut-outs that only one firm make, &c., but the writer is inclined to think that when they begin to ask for conduit fittings of a certain make, wires and cables of *Association quality*, wall-plugs of certain types, &c., they are exceeding the powers granted to them, and taking upon themselves authority which they have no right to.

"I am a believer in good work, but I, along with other contractors and also factors, do not like being dictated to too much as to whose make and what quality of goods I should sell and use."

*** Without an opportunity of perusing the local by-laws and the Act of Parliament under which the Corporation is acting, these questions cannot be answered with much certainty. As to (1) it would seem that there are certain by-laws in existence, and the Corporation is clearly entitled to enforce these. Speaking off-hand, however, it is apprehended that if the Corporation tests are satisfied the Corporation can make no further complaint.

As to (2) it may be that there is a by-law which enables the Corporation to insist upon certain types of wires, wall-plugs, &c., being used, but again, speaking off-hand, it is thought that such a by-law would probably be *ultra vires* and bad. In this connection, however, it is material to notice that by Sec. 18 of the Electric Lighting Act, 1882, "undertakers shall not be entitled to prescribe any special form of lamp or burner to be used by any company or person, or in any way to control or interfere with the manner in which electricity supplied by them under this Act, and any licence, order or special Act, is used." The fact that restriction may not be placed upon the use of particular lamps or burners gives colour to the suggestion that the use of specified fittings may be prescribed. The proper way to test the matter would be to install a set of premises independently of the Corporation and then allow that body to take such legal steps as it may be advised.

LEGAL.

The Hythe Telephone Dispute.

In the Chancery Division on Friday, November 3rd, Mr. Mecklein, K.C., stated to Mr. Justice Swinfen Eady that he had a motion in the action of the National Telephone Co. *v.* the Mayor, Aldermen and Corporation and Burgesses of the Borough of Hythe, to restrain the defendants from revoking, or purporting to revoke, wayleaves, or interfering with the company's poles. His Lordship would recollect that last week his learned friend, Mr. Russell, K.C., had another motion in the action of Dickens *v.* the National Telephone Co. He (Mr. Mecklein) was informed that his learned friend appeared in both cases, and was filing evidence in regard to the first. Under these circumstances he asked that both motions should stand over for a week, the undertaking given last week to be continued.

Mr. Russell, K.C., said he had only just received the notice of motion in the case of the company *v.* the Borough of Hythe, and it was necessary that that should stand over. As regarded the motion of Dickens *v.* the company, he was ready to go on with that, but he agreed with Mr. Mecklein that it would be better if both motions stood over until next week, on the understanding that the undertaking should be continued.

His Lordship consented to that course being taken.

Alleged Breach of Warranty.

At the Newcastle-on-Tyne Assizes, on November 2nd, before Mr. Justice Horridge and a special jury, an action was commenced for damages for alleged breach of warranty alleged to have been given in connection with a second hand steam condenser. The plaintiffs were the Urban Electric Supply Company, of Hawick, N.B., and the defendants were the Lumsden Machine Co., of Gateshead-on-Tyne.

Mr. Waugh, K.C., and Mr. H. B. Grotrian were for the plaintiffs, and Mr. J. Scott Fox, K.C., and Mr. R. M. Stephenson were for the defence.

Mr. Grotrian explained that the defendants pleaded that no warranty was given, or, in the alternative, if it were given, that it was fulfilled, and further, that if any such warranty were given there had been undue delay in bringing the action.

Mr. Waugh explained that the plaintiffs had various works in England and Scotland for the distribution of electricity. Intending to increase their plant at Hawick, they entered into negotiations with the defendants for the purchase of a condenser, and on February 28th, 1910, the defendants wrote offering to sell the plaintiffs a condenser capable of dealing with 15,000 lb. of steam per hour. Defendants were purchasing the condenser from the Coatbridge and Airdrie Electric Supply Co., of London and Coatbridge, for £275, and they sold it to the plaintiffs for £350, so that defendants got a fair return for their services in the matter. Plaintiffs' manager saw the condenser in sections at the premises of the Coatbridge Co. Plaintiffs asked the defendants for the original specifications of the condenser, and these the defendants obtained from the Coatbridge Co. The defendants were then informed that the condenser was capable of dealing with not more than 8,000 lb. weight of steam, but with that knowledge in their possession they did not inform the plaintiffs of the fact. When the machine was erected on the plaintiffs' premises it was, in fact, found to be incapable of meeting the demands of the plaintiffs, and was really useless for their purpose. The plaintiffs now held that the condenser was not worth more than £200, and on that ground they claimed £150, and they claimed a further £135 for the time and

material used in erecting the machine on their premises, so that the claim of the plaintiffs was £285.

Mr. Rye, plaintiffs' late manager, said he could not ascertain the condensing capacity of the machine when he saw it at Coatbridge, because he saw the machine dismantled and in sections, and he had not facilities for measuring up the tube area.

In cross-examination, Witness said he asked no questions as to cooling area. He examined the condenser for condition and not for capacity.

Mr. Alexander Anderson, assistant engineer to the plaintiffs, gave evidence as to testing the condenser, and said the machine was not capable of dealing with the amount of steam required by the plaintiffs.

Mr. Henry Joseph, plaintiffs' resident engineer, also gave evidence as to the inadequacy of the condenser.

Mr. John Elliott, an expert witness, also spoke as to the capability of the condenser. He had had 15 years' experience, and had dealt with approximately 2,000 condensing plants. The plant in question had a condensing surface of 854 ft. and was only capable of dealing with 8,500 lb. of steam, maintaining a 25-in. vacuum with water at 80° F. per hour. If the condenser was worked under the best possible conditions, it was not capable of dealing with 15,000 lb. of steam. The best possible was 10,000 lb. of steam, with a vacuum of 26 in. and water at 36° F.; those he considered were the best possible conditions.

The Court then adjourned, and resumed on the 3rd inst.

Mr. Scott Fox opened for the defendants. He said the plaintiffs had given no real evidence that the condenser was incapable of doing the work required of it by them. The machine was sold in June, 1910, and delivered in February, 1911. Plaintiffs had made two trials, at which the defendants were not asked to be present, or to be represented, and upon the result of those trials they based their case. Before fitting up the condenser, the plaintiff had made structural alterations in the condenser, which, in the opinion of the counsel, were calculated to interfere with its vacuum. Even if they had bought the condenser with a warranty, counsel submitted that they had no right to alter the machine before putting it on trial, and he asked the jury, even if all else failed, to find against the plaintiffs on that ground alone. He further complained that the machine had not been used to the best advantage. It had never been tried with a full head of water or with the air-pump working at its full capacity, and it was admitted by the plaintiffs that the circulating tubes were not clean. It was for the jury to satisfy themselves, before finding in favour of the plaintiffs, that the machine, with proper adjustment, and perhaps a little coaxing and a little patience, and before it was altered structurally, could not perform the work required by the plaintiffs.

Mr. Thomas Lumsden, Gateshead, managing director of the defendant company, gave evidence as to the sale of the condenser to the plaintiffs, and said he was of opinion that the machine would meet the requirements of the plaintiffs. Witness was cross-examined as to why he did not furnish the plaintiffs with the more detailed specifications which he received from the Coatbridge and Airdrie Electric Supply Co., Ltd., the former owners of the condenser, and in reply, he said he received those specifications on the day following the inspection of the plant by the plaintiffs' manager, and he did not communicate them because that gentleman had seen the plant. In regard to some correspondence between the parties prior to the sale, witness admitted that standing alone those matters indicated a sale by description, though he did not realise it at the time.

Prof. R. L. Weighton, Professor of Engineering at Armstrong College, said that since 1903 he had made a special study of surface condensing plant. The specification of February 28th, in which it was stated that the condenser was capable of dealing with 15,000 lb. of steam per hour, was handed to witness, who pointed out that no mention was made of the vacuum required. The essential feature of any condensing plant was the degree of vacuum required. Giving his opinion of the tests carried out by the plaintiffs, Prof. Weighton thought better results might have been obtained had the full volume of water specified been put through the condenser and the air pump worked at the proper speed.

After a long hearing the jury found for the plaintiffs, awarding £116 13s. 4d. damages, and £100 for the cost of erecting and taking down the condenser.

His Lordship entered judgment for £216 13s. 4d. and costs, and granted a stay of execution for 14 days with a view to an appeal being entered.

British Westinghouse Electric and Manufacturing Company, Ltd., v. The Underground Electric Railways Co. of London, Ltd.

On Tuesday and Wednesday the Court of Appeal, composed of Lords Justices Vaughan Williams, Buckley and Kennedy, had this case before them on the appeal of the plaintiffs against the refusal of the Divisional Court (Mr. Justice Pickford and Mr. Justice Lush) to set aside an award of an arbitrator, whereby plaintiffs' claim for about £80,000 in respect of the balance of the price of certain machinery was dismissed, and the defendants' counterclaim for damages for alleged breach of contract was allowed to the extent of about £20,000.

The proceedings in the lower Court have already been reported.

Sir A. Cripps, K.C., Mr. Disturnal and Mr. Tangye appeared for the appellants; and Mr. J. P. Fitzgerald, K.C., Mr. Roskill, K.C., Mr. A. B. Shaw, and Mr. L. Macassey for the respondents.

In support of the appeal, Sir A. Cripps submitted that in a claim for breach of contract of this kind the true measure of damages was the cost of putting the persons who had suffered through the breach in the same financial position as near as possible, as they would have been if the contract had been carried out. Inasmuch as the substitution of the Parsons machines put the railway company in a substantially better position than they would have been under the contract for the Westinghouse machines, that fact ought to be taken into account in ascertaining the cost. His complaint was that the arbitrator in assessing the damages, had failed to take that matter into consideration, and he contended, therefore, that the award ought to be set aside.

Mr. Disturnal followed on the same side, and the hearing was adjourned.

Coffin v. Gibbons and the P.M.G.

Mr. C. Hayden Coffin was the plaintiff in an action heard last week by his Honour Judge Sir William Selfe at West London County Court. The defendant was Mr. John E. Gibbons, of North Side, Wandsworth Common, an engineer working for the Post Office. The Postmaster-General was a third party interested, and Mr. Gutteridge appeared on his behalf. The claim (says the *Standard*) was for damage to Mr. Coffin's wall at his residence, Campden Hill Cottage, Kensington, caused by removing the footings in laying a Post Office telephone. Judgment was given for Mr. Coffin for £15 15s. and costs, together with an injunction.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

"Century" Hand Lamp.

Messrs. Ward & Goldstone, of Springfield Lane, Salford, draw attention to the features of their "Century" hand lamp, which has been introduced in order to overcome certain objections to portable accumulator hand lamps. The latter are heavy, troublesome to recharge, but dependent on its being regularly done for their efficiency, and the burning hours are much less than, for instance, those of the "Century" lamp. In the latter a new type of dry battery is fitted which, on test, has given one to three hours' burning daily, up to a total of between 60 and 85 hours.

"Century" Hand Lamp and Battery.

The dry battery is 6¼ in. high and 3 in. square, and gives 25 to 30 amperes at 4 volts on short circuit. The lamp is fitted with a 4-volt metal lamp and a lens, and is of English manufacture throughout; Messrs. Ward & Goldstone claim that no dry-battery hand lamp of this size has ever approached its burning hours.

U.S.A. Federal Incandescent Lamp Suit.—In March last the Federal Government filed suit against incandescent lamp companies for alleged violation of the Sherman anti-trust law. Last month the proceedings ended in a decree ordering the dissolution of the National Electric Lamp Co., of which the entire stock is now held by the General Electric Co., and of its 20 subsidiary companies, the business of which must hereafter be conducted in the name of the General Electric Co.; the defendants are enjoined from making agreements with manufacturers of lamp-making machinery and glassware which will prohibit the latter from making similar agreements with others; and all parties to the suit are enjoined from entering into any combination or agreement fixing resale prices of lamps or imposing conditions having any bearing on such resale. So far as relates to central stations and other consumers of incandescent lamps, the decision in the case appears to be quite sharply limited in effect to creating an open market for the ordinary carbon-filament lamp, in which trade competition alone will regulate prices. As that type of lamp, however, is now less used than the modern high-efficiency lamp, and is rapidly becoming obsolete, the consumer will not be greatly benefited by its release from artificial price conditions.—*Electrical World.*

METALITE, LTD.

On Monday last, at the invitation of the directors, we paid a visit to the new works which have been equipped at Derby by Messrs. Metalite, Ltd., for the manufacture of their tungsten lamps. It will be remembered that the company was floated in July, 1910, when it purchased the works of the Bryant Trading Syndicate at Horsell Road, Highbury, N. These works were then employed in the manufacture of metallic-filament lamps under certain secret processes, and the syndicate claimed to have developed a large demand for its filaments. Being in need of increased manufacturing facilities, which could not be secured in Highbury, the new company at the time of its flotation was in search of suitable premises, and eventually obtained them in the shape of a works built a few years ago for the manufacture of incandescent gas mantles, which had been closed as the result of a financial deal. These freehold works have now been equipped by Metalite, Ltd., with machinery and apparatus for the manufacture of their lamps, for which they are admirably adapted, and the substitution of the electric for the gas lamp industry cannot but be regarded as a happy omen for the future.

The building is laid out on one floor, except along the frontage, where there is a second storey, and it is excellently lighted from the roof—an important matter in a tungsten lamp factory. Besides the space occupied by the present building, there is ample room on the site for extensions.

The equipment provides for the manufacture of the complete lamp from start to finish. The filaments used are at present of the squirted type, but it is hinted that a drawn-wire filament is being perfected. Lamps of all the usual sizes are made, and are put on the market under the title of "British Metalite," it being the boast of the company that it is British made throughout. The latest types of machinery are installed in the various departments, and the equipment is capable of a large output, though at present, as the company is engaged in training local labour, the output necessarily falls far short of what, no doubt, will ultimately be attained.

At a luncheon which followed the inspection of the works, the chairman, Mr. W. Stewart, said that shares could still be obtained at par. The Mayor of Derby, Sir Thos. Roe, in giving a hearty send-off to the new industry, welcomed it as affording an opening for female labour—other large industries in Derby employing male labour almost entirely. Mr. J. Metcalfe claimed that the equipment of the factory was equal to that of any other works in the country; he referred to the early struggles of the company and the adverse criticism met with at the commencement, but said it was pulling through. More capital had been spent than was actually subscribed, thanks to their existing works and stock, and he appealed for the purchase of the company's shares, which, he said, in view of developments in progress, would shortly be worth double.

The engineer to the company, Mr. F. Harrison, said that experiments were being carried on in the works laboratory, and he hoped in a few weeks to produce something of a very startling nature, but could not enter into details.

Our views as to the constitution of the company were fully detailed in our issues of July 22nd and 29th, and November 4th, 1910, and we need not here repeat them. The company now possesses works which should enable it in due course to share in the growing demand for tungsten lamps; it is evidently short of capital, but we believe the technical processes supervised by Mr. Harrison are in very capable hands, and, for the sake of the shareholders, we hope the company will succeed in establishing itself on a sound and permanent basis.

Elland Electricity Supply.—At the meeting of the D.C. last week a resolution was adopted to the effect that an inquiry should be instituted into the working and cost of the electricity works. Mr. T. E. Cragg, who moved that this should be done, contended that according to figures which he had in his possession, the cost was now £11 per week more than it was in 1908. Although about £150 more had been spent on coal this year than in 1908, the units generated were considerably less.

BUSINESS NOTES.

Catalogues and Lists.—The Armorduct Manufacturing Co., Ltd., Farringdon Avenue, London, E.C.—Eight-page illustrated list of Armorduct luminous radiators, in which prices are boldly indicated.

The Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.—New catalogue of 64 pages containing a full and illustrated account of the Sturtevant heating and ventilating system, suitable apparatus and equipment being shown for various classes of buildings—factories and warehouses, schools and colleges, public halls and establishments, hospitals, &c., churches, theatres, &c., hotels and residences, electricity works, ships, tunnels, &c.

The Concordia Electric Wire Co., Ltd., The Wire Works, Crown Parade, Cricklewood Lane, London, N.W.—Pamphlet (Section 102) containing tabulated prices and technical data regarding their "Asbestin" high-conductivity copper wire, and asbestos braided wires for rheostats and radiator connections, and giving a brief account of the purposes and qualities of "Asbestin" insulation.

National Electric Lamp Association, Cleveland, U.S.A.—Bulletins 8C, dealing with miniature carbon lamps; and 12A, relating to the electric lighting of automobiles.

The Waltham Manufacturing Co., 2, Jackson Road, Holloway, London, N.—Illustrated leaflet giving prices and brief particulars of Waltham arc lamps (Proctor's patent), flame and enclosed, also small arcs for enlarging and projection work, and accessories.

We have received from the Transparent Printing Co., Ltd., of 155, Victoria Street, Westminster, S.W., some specimens of transparent printing by their new patented process. These specimens are specially adapted for shop window bill displaying. Being luminous with transparent letters on coloured ground they are effective and attractive. A price list has been issued.

Consular Notes.—Germany.—The British Consul at Stettin reports that electric central power stations are being erected in various parts of the province to supply towns, villages, estates and farms with electric light and power. Several of these stations are already working. They will be of great assistance to small farmers and artisans requiring power at a cheap rate, but there appears to be some doubt whether large landed proprietors will benefit to a similar extent. Up to the present steam engines have been used for agricultural purposes; it has, however, latterly been found that the cost of electric power is considerably higher. The current required for a threshing machine of average size is said to cost 2s. 1d. per hour; larger machines as now used would cost about £1 5s. to £1 10s. per 10 hours. Steam engines, on the other hand, consume about 7 cwt. of coal during 10 hours, and 1 to 2 cwt. more when driving the larger threshing machines. For heavy agricultural machinery the steam engine would, therefore, be the more economical. A wireless telegraph station is to be erected in the post office at Swinemünde. The tower is to have a height of 157 ft., and messages are to be received from a distance of 190 miles. The work will be carried out by a Stettin firm. Other similar stations are to be erected on the Baltic coast.

Sicily.—The British Vice-Consul at Catania reports that the Société Anonyme Tramways et Eclairage Electriques à Catane is about to undertake the construction of an electric tramway between Catania and Acireale (a rich agricultural district). The scheme was put forward by the Società Elettrica della Sicilia Orientale which is also interested in the enterprise.

Mexico.—The British Vice-Consul at Guadalajara reports that electrical machinery is being largely installed in the mining sections of the district as electrical power is being sold by the Cia. Hidro Electrica e Irregadora de Chapala from £10 to £12 10s. per H.P. per annum, thus effecting a notable saving over steam power. The current generated by the above-mentioned company is three-phase, 50-cycle. In general it may be said that consumers will transform the voltage down to 440 or 220 volts. All machinery used is of the alternating-current type. There are many British firms which issue catalogues in Spanish. Often, however, catalogues in Spanish are sent to buyers whose names evidently show that they are British. As it is frequently the case that British engineers are employed by Mexican firms, it would always be well to send catalogues to each applicant in both English and Spanish. Using both catalogues, it is comparatively easy for the engineer to explain technical points in the proper words to a Mexican employer. Commenting further on the use of electricity in the mines, the Vice-Consul states that in anticipation of the advent of this cheap power, numerous large and costly reduction plants have been erected at various mines. The cost of wood fuel has been about 14s. per cord. On a basis of 3¼ lb. of coal (price £2 8s. per metric ton) consumed per H.P.-hour and taking 2¾ cords of wood of average moisture as equal to 1 metric ton of coal, fuel costs formerly worked out at about £39 per H.P. per annum for coal and £27 per H.P. per annum for wood. The price at which electric power will be sold is £10 to £12 per H.P. per annum. Immense deposits of low grade ore hitherto untreatable on account of cost, will now be treated at a fair profit.

Bolivia.—The British Consul at Sucre reports that in the year 1908 a limited liability company was formed in Cochabamba, with a capital of 850,000 bolivianos (£68,000), subscribed chiefly by a German firm of electrical engineers, of Oruro, the same firm which founded the Electric Light and Power Co., of Sucre.

The principal aims of the Sociedad de Luz y Fuerza Electrica were to generate electrical energy from water-power on the River Chocaya and construct, first, a line of light railways or tramways

from the city of Cochabamba to its suburbs; second, an installation to provide electric power and public and private lighting; and third, to erect electrically driven flour mills and other industrial machinery.

By the end of the year 1909 the electric light and flour mills were so far successful that it was found convenient to raise the capital of the company to £100,000. In the year 1910, the capital was further increased by £300,000, in £4 shares, bearing an interest of 6 per cent. guaranteed by the State for 25 years.

By the terms of its agreement with the Government, which guarantees the interest on the stock, the company is investing the whole of the £300,000 in erecting larger generating stations and laying down a system of light electric railways of 30-in. gauge, extending over a distance of about 90 kiloms. (56 miles), connecting the city of Cochabamba with the rural towns of Arani, Quillacollo, Vinto, Punata, Tarata, Cliza and Calacala.

The towns given above represent centres of great agricultural activity, and there is no doubt that, by connecting them with Cochabamba, they will help to feed and increase the traffic on the railway line to Oruro.

Later in his report, the British Consul says that no accurate information is officially given showing the proportion that British imports bear to those of other countries in the separate districts of Bolivia, but it can be assumed that the proportion in the districts of Sucre and Potosi is more or less the same as for the whole country. Thus, deducting from the total amount of British imports in 1910, a very large part which arrived in gold, and making allowance for a considerable sum representing the value of railway material, which went specially to Potosi and Cochabamba, it appears that British manufacturers are still holding their own, and even gaining upon those of Germany and the United States. The Consul is convinced that British firms would find it very profitable to establish branches in the district to deal principally in articles of British manufacture.

Admitting that it would not pay to have branch houses in every town comparatively thinly populated as in Bolivia, with foreign employés who would naturally command high salaries, the plan of utilising the native element, properly organised on systematic lines and subject to control and strict supervision from one central office might be followed. In one case, the central office has been established in La Paz, where a very few experienced employés have increased their staff as the business grew by taking in promising young people from among the natives, and these, when they were seasoned and the unfit weeded out, were sent off to minor branches in the provinces. They took with them the business principles they had acquired, added to their own knowledge of the *clientèle*, local freights, means of transport, the credit and even the particular idiosyncrasies of the people with whom they had to do business. Nay, more, it is found in practice that this system sets up a bond of sympathy between the population and a foreign firm which goes a very long way towards creating trade. In course of time, as the business developed, the most trusted men from the staff of the central office were successively sent forth to establish branches in all the capitals of departments, *i.e.*, Sucre, Oruro, Cochabamba, Potosi, Santa Cruz, Tarija and Beni, and each of these has thrown out minor branches into the provinces to the number of 32 altogether. One experienced man, doing the round of all these branches and minor dependencies occasionally, keeps them all working in proper order, at the same time that he looks into reports of possible new openings, of alterations in the routes of transport to economise time and freight, also for extending the business generally.

Exporters and packers should always bear in mind that the violent shocks, continuous movement, and the exceptionally rough treatment, suffered by goods coming into this country, can never be overestimated, but that they are very frequently underestimated. Cases should always be of the strongest, and the goods very securely packed, so that nothing inside can possibly become loosened. Experience has shown that when cases contain parts that may, under rough treatment, get loose, it is very advisable to cover such cases over with canvas or strong linen. Iron bands can hold a case together, but when it contains a machine, for example, nuts, screws and other small parts easily drop out if a single board of the case is broken, thus rendering the machine unserviceable for months, until new parts are obtained, whereas with a canvas cover all the contents are held inside. Boxes sent by parcel post are generally insecurely packed. In this respect it should be borne in mind that when such boxes become even partially broken *en route*, this affords the only possible pretext for unscrupulous persons wilfully to complete the damage and extract the contents with perfect impunity. Otherwise, parcels coming by post are only opened once—at their destination and in the presence of the owner.

Uruguay.—The British Minister at Monte Video reports that, in order to obtain orders, the personal visit of a traveller is much more effective than a catalogue sent by post. The following advice is, however, offered to those who cannot face the expense of sending out travellers and have to rely on the power of printed matter. First, a catalogue should have an attractive cover and handsome illustrations. Secondly, quotations in English measures of weight and length should be avoided, and the English language should not be used in the text of the catalogue. The majority of merchants in this country do not understand English sufficiently to read an English catalogue with certainty, nor do they care to puzzle their heads with English weights and measures. The ideal catalogue for Uruguay would be written in Spanish, with the prices quoted in Uruguayan gold ($4.70 c. to £1), and the measurements according to the metric system. The next best would be a catalogue written in Spanish, with the measurements according to the metric system and the prices quoted in pounds sterling and decimals of pounds, or in francs, which are easier than the former to convert into Uruguayan money.

With regard to travellers, it may be pointed out that if British firms desire to open up new business in this country, it is rarely sufficient for their representative to pay a passing call on one or two merchants on his way to Buenos Ayres. The merchants of this country are not disposed to enter into business relations with travellers whom they do not know personally. It is, therefore, necessary that ample time be allowed for travellers to make themselves known to the merchants with whom they wish to do business. Once they have established personal relations of this kind, they will have to go far before they find such good faith, such courtesy, and such attention as they will meet with among the merchants of Uruguay.

Siam.—The British Consul at Chiengmai reports that, through the abandonment of the palace of Petchaburi, which was being built for the late King, the Government have now on their hands an expensive electric plant designed for that building. In order that it might be utilised, it was suggested that it be set up in Chiengmai, which is still without any scheme of lighting, however crude, though the second city in the kingdom. The chief difficulty in the way of this scheme, which would obviously confer great benefit on Chiengmai, is the lack of proper fuel. Paddy husk, used in Bangkok, is here unobtainable in sufficient quantities, and oil fuel is out of the question, on account of expense. There remains only firewood, and it is doubtful if an adequate supply of this can be obtained. A plant driven by water-power seems the only one suitable. The Siamese Government have recently sent up an electrician to make inquiries and report upon a scheme for adapting this plant to Chiengmai.

Book Notices.—*A Course of Elementary Workshop Arithmetic.* By H. A. Darling. 1911. London: Blackie & Son. Price 1s. 6d.—This is a very simple and practical course, beginning with a few revisionary exercises and working up to mensuration, duodecimals and graphs. Throughout the work care is taken to interest the student by drawing examples from the every-day problems met with in various trades and workshops, with excellent illustrations, and the data used are such as the student will recognise as being in agreement with those to which he is accustomed in his avocation. There is no electrical section, but the book is well adapted for the preliminary instruction of electrical trade students.

"Science Abstracts." Sections A and B. Vol. 14, Part 10. October 25th, 1911. London: E. and F. N. Spon, Ltd. Price 1s. 6d. net each.

"Atti della Associazione Elettrotecnica Italiana." September, 1911. Milan: Stucchi, Ceretti e C.

"*Announcements* 1 and 2 of the Eighth International Congress of Applied Chemistry, September, 1912." New York: The Secretary.

"Electrical Engineering Test Sheets." By F. C. Caldwell. 1911. London: Hill Publishing Co. Price 9s. 6d. net.

"The Telegraphists' Guide." By J. Bell and S. Wilson. London: S. Rentell & Co. 1911. Price 2s. net.

"*Proceedings* of the American Society of Civil Engineers." Vol. XXXVII, No. 8. October, 1911. New York: The Society.

"Electric Mains and Distributing Systems." By J. R. Dick and F. Fernie. 1911. London: *Electrician* Printing and Publishing Co., Ltd. Price 10s. 6d. net.

"*Proceedings* of the Engineers' Club of Philadelphia." Vol. XXVIII, No. 4. October, 1911. Philadelphia: The Club.

"Boletin de la Sociedad de Fomento Fabril." September, 1911 Santiago de Chile: Casilla 44D.

We have received a "Circular of Information concerning Patents for Inventions and the Registration of Designs and Trade Marks," from Messrs. Wheatley & Mackenzie, consulting engineers and patent agents, of 40, Chancery Lane, W.C.

Trade Announcements.—Scholey & Co., Ltd.—A company of just a dozen, mainly Press-men, a *recherché* dinner in Pagani's best style, a new addition to the industrial firms of the electrical world, and Mr. Scholey's eloquent arguments in favour of the *raison d'être* of his company's birth, served to pass away a most delightful evening on Friday of last week. The only toast was that of "Success to the new firm of Scholey & Co., Ltd.," to which both Mr. Scholey and his partner, Mr. Hill, replied in feeling terms.

It has been a favourite idea of Mr. Scholey's for some time past that much could be done to improve the condition of the electrical industry by a judicious system of co-operation. He referred mainly to the possibilities of manufacturers being in closer touch with one another in regard to the merely manufacturing side of these undertakings. There are in this country several large concerns with magnificently equipped factories and highly trained technical staffs, which in ability are second to none in the world, yet they would have gained considerably if they had been subjected to interchange of ideas, both in regard to manufacturing and designing of machinery. At some time or other they must be of necessity engaged on similar problems, each working them out in their own way, and he thought it seemed feasible that an enormous wastage would be saved if one manufacturer were to tell another of the manner in which he had overcome difficulties that had beset his path on some occasion or other. By a pooling of interests, under which each manufacturer had a share of a contract, it would be possible to keep in this country much of the work which at present finds its way to foreign countries. Moreover, a combination of this character would bring great influence to bear on those financial people who are ever ready to find money for electrical schemes abroad. It may be taken for granted that no manufacturer, no matter how well his works are organised, and no matter how clever and ambitious his staff may be, can economically cover the whole field of electrical engineering. Probably there are one or two special

examples in manufacturing in which he stands without a rival; then another manufacturer is equally efficient in some other direction, and so you proceed until you have a group, each member of which can perform a particular function in electrical work with conspicuous success. Would it not be in the highest interests of all, if such manufacturers could confine themselves to that particular work which they do best, instead of attempting to deal with so many different types of apparatus? Then on such occasions when it was necessary to devise large and comprehensive schemes, the manufacturers in co-operation would be able to deal effectively with them, and in that manner be in a strong position to meet the competition of the large foreign organisations. In Mr. Scholey's opinion there has been far too much attention paid to manufacturing and not sufficient consideration given to the purely commercial side of the business. Then, again, there has been an unfortunate tendency whenever a manufacturer has been successful with a particular machine or apparatus, for other manufacturers to immediately copy it, and consequently we have soon arrived at a state of over-production. It may be urged that this is arguing too much in the realms of conjecture; he would, therefore, come to a more immediate and perhaps a more practical phase of the subject. One is aware that there are scattered throughout the country numerous comparatively small manufacturers, who in a somewhat modest way are carrying on a reasonable business with considerable advantage to themselves. He had in mind those manufacturers who specialise on a particular article and being able to reap the benefit of repetition work in their factories, and not being encumbered with heavy establishment charges, can produce a first-rate article at a comparatively moderate cost. It will be a matter of general interest to know that as a result of careful investigations, it may be emphatically stated, that in regard to both quality and price the products of these manufacturers are equal to anything that the world can produce. Moreover, it should never be overlooked that, collectively, the specialist manufacturer forms a backbone of the British electrical industry, and of the capital invested in manufacturing by far the largest proportion is invested in the small and scattered works of the country. The strength of the small manufacturer, however, is his weakness. So long as his trading is, comparatively speaking, local, he invariably succeeds, but directly he attempts to widen the area of his operations, he runs the risk of his prices going up by virtue of his increased selling expenses. The specialist manufacturer, however, deserves a wider market on account of the quality and comparative cheapness of his wares, and it had occurred to him that there was room for an organisation which could undertake the selling for a group of what he would call "the specialist manufacturer," and it is precisely that which his company is attempting to do. The company has entered into certain definite agreements with manufacturers, and in time it is expected to add others. The proposition of Scholey & Co. is, that they will devote themselves entirely to the development of suitable markets, and the manufacturer shall confine himself to making material, looking to the company to effect the sales. They expect to do considerable trading at home, but mainly they desire to further trade abroad, for which purpose they will eventually establish agencies both in this country and in the most prominent towns in the British Colonies and South America. Notwithstanding that our foreign competitors have been and are sending a good deal of material abroad, there is a strong disposition in favour of doing business with people in this country, and the new concern proposes to take advantage of that feeling. In the course of discussion which ensued, it was further explained that the large manufacturers in this country are exceedingly friendly to the idea, and in three or four cases have made definite offers to help. It was also stated that the new company is not confining itself to electrical work, but will be actively engaged in selling various mechanical appliances and machinery.

Well as Mr. Scholey is known to everybody, we have the advantage of having been intimately associated with him for 22 years. For the first 10 of these he acted as assistant editor of the ELECTRICAL REVIEW, and it was during this period that our daily intercourse led us to form an opinion of his worth and ability which has become strengthened as years have gone by. He served the REVIEW right loyally and well, and during his tenure of office he had ample opportunities of making the friendship of many of the best men in the electrical profession, friendships which he has retained to this day, and which we hope and believe will be of the greatest assistance to him and his partner in the new sphere of operations in which they have chosen to embark.

When Mr. Scholey left journalism as a profession to engage in that phase of the engineering world in which he has made himself so popularly known throughout the length and breadth of the country, we lost the services of one in whom we placed our complete confidence, but our loss was his gain, and although we were deprived of his invaluable co-operation we have ever remained on the best of terms.

We need not refer to the two years he spent in the service of Messrs. Mather & Platt, beyond the fact that he there gained the experience which was to serve him to such good purpose when he joined the firm of Messrs. Dick, Kerr & Co., Ltd., whose employ he left only a fortnight since, although it has been an open secret since the beginning of the year that his intention was to commence business on his own account. No firm could have had a more devoted and loyal member of its staff than Mr. Scholey proved to that just mentioned. His personality was an asset to that firm of the highest value, and we know that more than one rival concern would gladly have engaged Mr. Scholey's services at considerably higher remuneration had he chosen to accept the overtures made to him.

Nobody knows better than ourselves the sterling worth of the senior partner of Scholey & Co., and we make bold to say that he commands the confidence of the whole electrical fraternity. Of Mr. Hill we can only say that if he had not the most implicit confidence in Mr. Scholey, and the most optimistic conception of what the newly-formed company will achieve, he would not have relinquished the post of engineer and manager to the Bournemouth tramways to throw in his lot with the company, and Mr. Scholey would certainly not have entertained the idea of a partnership with Mr. Hill unless he, too, was perfectly satisfied that he had in him, met his *alter ego*.

We wish, and we believe our readers will re-echo our wish, the new venture God-speed and every success, for although 'tis not in mortals to command success, they'll do more, they'll deserve it.

MESSRS. D. EDGAR GREENWOOD, A.M.I.C.E., & J. KILNER WELLS have opened a coal-testing laboratory at 25, York Place, Baker Street, London, W., where they will attend to inquiries from central station engineers and others who may, from time to time, wish to know the calorific value and other properties of the coal or oil fuel they use.

THE WARNER INTERNATIONAL AND OVERSEAS ENGINEERING CO., LTD., of Carteret Street, Westminster, S.W., announce that they keep, for the convenience of their clients, a list of rolling stock for which the owners have no further use.

MR. J. W. RECORD, late manager of the instrument works of the General Electric Co., Ltd., now the Salford Electrical Instruments, Ltd., and MR. T. J. BOORNE, under manager of the switchgear, instruments and electric light accessories department of the General Electric Co., Ltd., London, who both recently resigned their respective positions in order to commence business under the title of "The Record Electrical Co., Ltd.," have now opened their new works at Broadheath, near Manchester, where they intend to manufacture electrical instruments and other specialities. Mr. Record will control the works and conduct the Manchester business, whilst Mr. Boorne will look after the firm's interests in London from their office at Caxton House, Westminster.

THE REES ROTURBO MANUFACTURING CO., LTD., Wolverhampton, have altered their telephone number to 900 (two lines).

MESSRS. PRICE & CO., electrical engineers, of 16, High Street Newport (I.W.), have opened a branch business at Shooter's Hill West Cowes.

MESSRS. RICHARDSONS, LTD., Billiter Square Buildings, London, E.C., have just been appointed London representatives of Messrs. Tait & Co., Kobe, Japan, who are opening an engineering department. Firms desirous of doing business in Japan and the East are invited to send catalogues in duplicate to Messrs. Richardsons' Export Department.

Bankruptcy Proceedings.—W. H. HOWARD (Holborn Electrical Co.), electrical engineer, 5, Featherstone Buildings, Holborn, and Finsbury Park.—Receiving order made November 1st, on debtor's petition.

E. J. CROSIER (Crosier, Stephens & Co.), engineer and merchant, Newcastle-on-Tyne.—November 25th is the last day for receipt of proofs for dividend, by the trustee, Mr. J. A. Gardner, 145, Pilgrim Street, Newcastle-on-Tyne.

Voluntary Liquidations.—DAVIS ELECTRICAL CO., LTD., 17, Moor Street, Cambridge Circus, W.—The adjourned meeting of the creditors, convened by the liquidator under Sec. 188 of the Companies (Consolidation) Act, 1908, was held on Monday at Armfield's Hotel, South Place, Finsbury, E.C. Mr. George Corfield, the Liquidator and Receiver for the debenture-holders, presided. At the original meeting on October 23rd, a statement of affairs was submitted by the liquidator showing liabilities to unsecured creditors, £3,333, and assets £2,885. There were debentures issued to the amount of £3,313, leaving a deficiency as regards the debentures of £427, and no assets available for the creditors. Mr. Corfield reminded the meeting that the adjournment had taken place to allow a committee of the creditors to consult with Mr. Davis and the debenture-holders on the possibility of formulating a scheme of composition. The committee had met, and there was no formal proposal submitted to them, Mr. Davis stating that he was not yet able to submit any offer. Mr. Davis had, however, mentioned the figure of 2s. 6d. in the £, but he (Mr. Corfield) had stated that that was one which the creditors would probably not consider. The position, therefore, resolved itself into one where there was no offer before the meeting, and it was a question for the creditors to consider what resolution they would propose. Mr. Lowe, representing Messrs. J. McDougal & Co., thought that Mr. Davis should be present in order to hear what the creditors had to say and to answer any questions that might be put to him. It was not so much a matter of his making an offer of composition as it was giving up some portion of the debentures, whose value had been enhanced by the use of the goods belonging to the creditors. Mr. Davis was then called in, and remained throughout the meeting. Mr. Rook, representing two of the principal creditors, a member of the committee appointed on the previous occasion, said that he had had an opportunity of going through the statement of affairs of the company as presented by Mr. Corfield, and he found that from September 1st last to October 16th the company had purchased £1,600 worth of goods. The statement of affairs showed total unsecured liabilities £3,333, and, therefore, the purchases between those dates were practically half of the total liabilities. The stock in trade at the date of the statement of affairs amounted to £1,735, which was very little more than the amount purchased in that period. For the purpose of the statement of affairs there was a discount of 25 per cent. taken off cost, amounting to £433, which was absurd, having regard to the fact that the goods were new and only just delivered. But whether the goods purchased

had gone into stock or into book debts he had not been able to ascertain. The fact remained that the unsecured creditors' claims amounted to £3,333, and the debenture claims amounted to within a few pounds of the same total. He thought that this was a case in which the debenture-holders might take 10s. in the £ and the creditors the other 10s. As it was, in the absence of any such proposal, the debenture-holders had it all, and the creditors would receive nothing. In these circumstances he thought the creditors would be well advised not to agree to confirm the appointment of Mr. Corfield as voluntary liquidator, but to take some action among themselves to have matters properly investigated. The large purchases of goods during the last days of the company's existence wanted some explanation, and more especially as he understood some goods were received by the company after the date when the resolution to wind-up was passed for the reason that the company was not able to carry on its business. Mr. Lowe, also a member of the Committee of Inspection, said he confirmed what Mr. Rook had stated. He maintained that it was impossible for Mr. Davis to say that he was unaware of the position of the company when he was ordering the goods referred to in September, and the creditors had to consider the question of his personal responsibility. Mr. Kennard, the solicitor of the company, explained the circumstances under which he was consulted. The meeting which passed the resolution for winding-up was not held until October 6th, and he thought it was not right to suggest that Mr. Davis was not entitled to order goods as he had done. A creditor contended that Mr. Davis knew the position of the company at the time, and as he had to go to his father-in-law and ask for money, he was not entitled to order fresh goods, and use them to swell the property which the debenture-holders could claim. Goods to the value of £1,600 were accumulated in the month prior to the winding-up, while the debenture-holders stood to get everything, and the creditors nothing. Another creditor said it was clear Mr. Davis had been ordering goods while he knew the company was insolvent. The proper course in the circumstances was compulsory liquidation where the machinery of the Court would allow matters to be fully inquired into, and make persons personally responsible if they were properly so. He pressed the creditors not to assent to the voluntary liquidation, so that a petition might in due course be presented to the Court for compulsory liquidation. Other creditors spoke in the same strain, and were followed by Mr. Davis, who stated that when he ordered the goods in September he did not know the company was insolvent. He invited any of the creditors to inspect the company's books and check the stock to see whence the goods had gone. A creditor remarked that if the £1,600 worth of goods had been sold, where was the cash for it? It was either stock or book debts, and there were only £1,600 worth of book debts now. After considerable discussion, in which the purchases and sales of the company were gone into, it was proposed that "The appointment of Mr. Corfield as voluntary liquidator be not confirmed, and a petition be presented for compulsory liquidation of the company, and that the committee already appointed continue to represent the creditors, and advise them as to the best course to pursue." A creditor inquired whether it was not a fact that some portion of the last debenture issued was in respect of arrears of salary to Mr. Davis, and Mr. Kennard replied that the last debenture issued was to secure money advanced by Mr. Davis, and £100 representing arrears of salary. There was considerable further discussion, and in the result the resolution not to confirm Mr. Corfield's appointment with a view to compulsory liquidation, was carried with one dissentient.

Beck Flame Lamp, Ltd., Suffolk House, Laurence Pountney Hill, London, E.C.—A largely attended meeting of the creditors of the above was held on Monday at Winchester House, Old Broad Street, E.C., the voluntary liquidator, Mr. Herbert J. Page, of Messrs. Annan, Dexter & Co., 21, Ironmonger Lane, E.C., being in the chair. It was reported by the chairman that on October 2nd last, the trustees for the first debenture-holders appointed his partner (Mr. Edward Dexter) to act as Receiver. The debenture-holders took that action because certain of the creditors were threatening to enforce their claims. The Receiver had been carrying on the business with a view to its sale as a going concern. It was thought that the best course to adopt was to offer the business for sale by tender. As the liquidator of the company he had not at present any assets to deal with. The Receiver would have to hand over to him the balance that remained after paying all costs, charges, and satisfying the claims of the debenture-holders. Those principally concerned were of the opinion that the best price would be obtained by the offering of the business for sale by tender, and he saw no reason to question that view. Under the circumstances he did not think it would be wise for him to place any values on the assets of the business. According to the balance-sheet of the company, prepared in March of the present year, the tools, patterns, drawings and patents were valued at £13,905, plant and machinery at £1,482, office furniture at £182, and the stock in trade at £4,892, or a total of £20,469. There were, however, book debts of the face value of £956, which were estimated to realise £557, and cash in hand £29 19s. 3d. The assets therefore totalled £21,047, but they were subject to charges aggregating £7,042, which left the net assets at £14,004. The charges consisted of preferential claims £194, first mortgage debentures and interest £5,975, and second mortgage debentures and interest £872. The claims of the unsecured creditors amounted to £4,937, and as regarded the creditors a surplus was shown of about £9,000. The claims of the unsecured creditors might be increased by a small amount, and the surplus shown was subject to the realisation of the assets. A scheme for the reconstruction of the company had been brought before the shareholders, but it involved their finding a sum of £7,000. The shareholders did not respond to the invitation to take up new preference shares in the company, and therefore the scheme fell through. Mr. Spiller, who stated that he represented one of the principal creditors, asked if there was a series of undisclosed mortgages on certain of the book debts of the company. He added that such charges ought to have been registered, but that had not been done. The liquidator replied that he believed some of the book debts had been sold, but he was not in possession of the full details of the matter. Mr. Spiller replied that book debts had really been mortgaged at so much per cent. He declared that the business of the company had not been carried on in the ordinary way. A reconstruction scheme was proposed last June, but it was not brought before the shareholders till the end of September—two days before the Receiver was appointed. In his opinion the business possessed by the company was a good one. The chairman said that the claim by Mr. Spiller's firm was not all admitted. As regards the debentures there was a first issue for £6,000 in March, 1909. Second debentures for £2,000 were created on September 20th last, but only £870 were issued. Mr. Scholey remarked that he had come to the meeting fully expecting that an offer of 20s. in the £ would be made to the creditors. He had formed that opinion after reading a circular issued by the company in which creditors were asked not to press. The principal assets were the patents, and apart from them there was not sufficient to pay the debenture-holders, let alone the unsecured creditors. Replying to questions, the chairman stated that the company was formed in March, 1909, with a capital of £30,000, divided into 28,000 ordinary shares of £1 each, and 2,000 deferred shares. In all 14,100 shares had been issued for cash, and 4,000 ordinary and the 2,000 deferred shares were issued for a consideration other than cash. Mr. A. M. Billington, the late managing director of the company, said that after the first 18 months' trading the company had lost most of its working capital. Since then some difficulties had been experienced, but they had managed to work the business up. One or two creditors had threatened to compulsorily wind up the company. He himself was the principal creditor of the company, and also the largest debenture-holder. Mr. Spiller said it was proposed to sell the business by tender, and he desired to see it offered for sale publicly. After a short discussion, a resolution was proposed by Mr. Scholey in favour of the appointment of his principal (Mr. G. E. Corfield) to act as the joint liquidator of the company, with Mr. Page. The resolution was seconded by Mr. Spiller and agreed to, and a committee of three of the trade creditors was also elected.

Smoke Abatement.—In connection with the Manchester and Salford Smoke Abatement Exhibition, which opens to-day in the City Exhibition Hall, Manchester, and will continue until November 25th, Messrs. E. Bennis & Co., Ltd., who are exhibiting at stands Nos. 20 and 23, have issued a new pamphlet. In this they show in detail some of their various manufactures and the installations in which they are employed, expressly intended for the abolition of smoke and the cheap generation of steam in leading boiler houses in the United Kingdom. General descriptions appear of their different stokers and self-cleaning compressed-air furnaces, and large half-tone views are included of steel works, electricity works, tramway station, colliery and other boiler houses.

Liverpool International Exhibition, 1912.—We have received preliminary particulars of the above Exhibition, which is to be held from May 1st to October 31st next year on the Edge Lane Hall Estate. The general aim of this Exhibition is somewhat similar to that of the Glasgow Exhibition of the present year—namely, to emphasise the developments of mechanical and electrical machinery, arts, crafts and textile work, and in view of the location of the Exhibition, it should be of exceeding importance to our mechanical and electrical friends in the Midlands and in the North. We understand that the advance applications for space and inquiries in connection with the Mechanical and Electrical Hall show that the popularity of the Exhibition is not diminishing, and a further expansion of business in the electrical trade may reasonably be expected from this Exhibition. We shall give fuller details in a later issue.

Dissolutions and Liquidations.—Rugby School Electric Lighting Co., Ltd.—This company is winding up voluntarily, with Mr. A. E. Donkin as liquidator.

Imeson, Finch & Co., Ltd.—A meeting of creditors is called for November 15th at the office of the liquidator (T. R. G. Rowland), Victoria Buildings, Stockton-on-Tees.

Byrd's Electrical Co., 24, Dale Street, Liverpool.—Messrs. H. T. Byford and H. Speight have dissolved partnership as from December 31st, 1910.

Dynamic Thermometer Co., automatic temperature regulating experts and manufacturers, 11, The Terrace, Barnes, S.W.—Messrs. H. S. Benson and E. and T. J. Rorke, have dissolved partnership.

British Electric Time Co., manufacturers of electric clocks, Kingsway House, London, W.C., and C. E. Harrison & Co., Curtain Road.—Messrs. C. E. Harrison and L. J. Aron, have dissolved partnership. Mr. Aron continues the businesses.

With reference to a notice appearing under this heading in our issue of last week, The Economic Electric Co., of Twickenham, S.W., ask us to state that they are in no way connected with the Economic Electric Co., Ltd. (Liverpool) there mentioned. The Twickenham firm has been trading under the above name since 1896.

Smithson, Sharpe & Co., electrical and mechanical engineers, Sykes Street, Hulme, Manchester.—Messrs. Herbert Smithson and Edgar Ravenhill Sharpe have dissolved partnership. Mr. Smithson will attend to debts and continue the business as sole proprietor under the old title.

Sandy & Franks, electrical and mining engineers, Defiance Works, Massinger Street, Old Kent Road, S.E.—Messrs. W. J. L. Sandy and H. W. Franks have dissolved partnership. Mr. Sandy attends to debts.

Winchester Electric Light and Power Co., Ltd.—Creditors must send particulars of their debts, &c., to the liquidators (Messrs. F. E. Gripper and A. R. Dyer) by November 30th.

Electrical Works and Development Co., Ltd.—A meeting is called for December 8th at 52, Gracechurch Street, E.C., to hear an account of the winding up from the liquidator, Mr. R. Boughton.

LIGHTING and POWER NOTES.

Allerton Bywater.—The P.C. has had under consideration estimates of the cost of lighting the parish by gas and by electricity. After discussion, it was decided to obtain further information and to adjourn further consideration of the matter until the next meeting.

Bognor.—The U.D.C. has decided to consent to the application for a prov. order for electric supply, to be made by the chairman, Mr. W. Tate, J.P. The Council is to have the option of purchasing the undertaking at the expiration of 15 years, or at the end of every subsequent five years, and current is to be supplied at a maximum price of 6d. per unit for private lighting, and at 4d. for public lighting.

Canada.—The creation of a new portfolio, with the designation of Minister of Power, is announced from Ontario. The Hon. Adam Beck, chairman of the Hydro-Electric Commission, will be appointed.

Continental Notes.—Sweden.—The power station at Trollhättan is now undergoing considerable enlargement, two new turbines of 10,000-H.P. normal capacity being in course of installation. At present four similar sets are at work, these forming the equipment at the opening in March last. As, however, one set is held in reserve, it has become needful, in consequence of the rapid increase in the demand for current, to enlarge the station's capacity. The hitherto available turbine units have been so much drawn upon in late months, that a maximum yield of 25,000 H.P. has now been reached. As the normal yield of the three turbines is 30,000 H.P., and fresh demands for municipal and industrial uses are coming steadily in, the necessity for the enlargement has become apparent. The erection of the new turbines has so far advanced, that it is hoped to set them running early in the new year. They will raise the total capacity of the plant to 60,000 H.P.; the maximum capacity of the present station is reckoned at 80,000 H.P. The Waterfalls Administration have recently opened negotiations with Uddevalla respecting a supply of electric current from that station, and the contract is expected to be sealed within a few weeks' time. This contract is a preliminary to the erection of a new transmission line first to Uddevalla, then to Munkedal, and possibly also to Lysedal. It is further hoped, by means of this line, to secure customers for current among the numerous stone quarries on the West Coast, who will thus be provided with the opportunity of modernising their works. The Waterfalls Administration are prepared, so soon as the contract with Uddevalla is completed, to begin the erection of the West Coast transmission line, the completion of which is expected in the course of next year. There already exists a line to Gothenburg, and also one to Kungälf and Tofta, branching of from the Gothenburg line near Nol. With regard to the projected supply of current to Copenhagen, it is now considered that no technical obstacles stand in the way. Attention is, therefore, being concentrated on the national-economic side of the question, and before the end of the year the Waterfalls Administration will lay the results of their investigations before the Government. The Water Department will itself conclude no contract with the Danish capital, nor will the Government on its own initiative, but the matter will be left to Parliament. On the Danish side the greatest interest in the matter is shown, and it is not improbable that an agreement to supply current to Denmark will be arranged. As to the Trollhättan works generally, it is considered that, notwithstanding the retarding agencies at its start, it has fully justified calculations, and that the gross receipts, which totalled 750,000 marks at the end of 1910, will attain to nearly a million marks this year.—*Elektro. und Masch.*

The Waterfalls Department have instructed Prof. G. Cassel to institute an inquiry into the advisability of exporting electric current from Trollhättan to Denmark for a period of 20 years, and at a price of about 100 kroner per KW.-year.

Spain.—The municipal authorities of Algemes (province of Valencia) have just invited tenders for the concession for the electric lighting of the town during the period of ten years.

Dartford.—The U.D.C., on November 3rd, decided to apply for a loan of £8,500 for electricity purposes, viz., Uniflow engine, balancer, switchboard, superheaters, piping, feed pump and buildings, £5,700; cables, &c., for three years, £1,000; boiler, £1,600; contingencies, £200.

Devonport.—The T.C. is negotiating with the Admiralty for the supply of current for lighting and power to the Royal William Victualling Yard, the Naval Ordnance Depôt and the King's Harbourmaster's jetty.

Epsom.—Mr. J. F. C. Snells has been selected to advise the U.D.C. as to the purchase of electrical power plant at a fee of 50 guineas. The Council is applying to the B. of T. for license to supply electricity to premises in Ewell.

Glastonbury.—At a meeting of the T.C., a committee of the whole Council reported the receipt of a letter from Messrs. Purves, referring to the notice they had given of their intention to apply for an E.L. order, and suggesting supplying the Corporation in bulk at a guaranteed minimum rent, and also the construction of a refuse destructor. The matter was fully considered, and the town clerk was instructed to reply to the effect that Messrs. Purves' proposals did not meet with approval, and declining negotiations. At another meeting of a committee of the whole Council, the question of electric light for the borough was further considered, and it was unanimously resolved that it was most desirable that the control of the lighting of the town should be in the hands of the Council, and as notice had been received of the intention of other parties to apply for an E.L. order, the Council was recommended to take the necessary steps to obtain an order itself. This the Council decided to do.

Great Harwood (near Blackburn).—The U.D.C. has decided to apply to the B. of T. for a provisional order authorising the Council to introduce electric lighting and power for all public and private purposes within the urban district.

Greenock.—An electrical exhibition, promoted by the electricity department of the T.C., has been held in the Town Hall—from October 31st to November 7th—the time having been extended three days. Like the previous exhibition, the recent one has proved in every way successful.

Herne Bay.—At a meeting of the U.D.C. on November 1st, it was reported that the clerk had communicated with about 100 electrical companies, inquiring whether they would be prepared to negotiate with the Council regarding the carrying out of the E.L. Order, and only six replies had been received. Two companies declined to negotiate, two stated that they could do nothing unless a local company was formed, and two expressed willingness to submit a scheme for carrying out the Order. The Council again deferred the matter for further information to be obtained.

Hove.—The Lighting Committee of the T.C. has decided to engage Messrs. Hancock & Dykes to make an inspection of the plant at the Holland Road electric generating station at the end of the current year.

Hoyland.—The U.D.C. has resolved that in view of the electric lighting scheme now under consideration, the question of the proposed lighting of Skiers Hill and Duke Street and the introduction of automatic lighting be deferred.

The Council has also decided to have another interview with the representative of the Yorkshire Electric Co. in reference to the suggested electricity scheme.

Lincoln.—The T.C. has applied to the B. of T. for consent to the use of overhead lines for the transmission of current at a pressure of 460 volts from Yarborough Road to the military barracks.

Llandudno.—An inquiry has been held on behalf of the L.G.B. into the application of the U.D.C. for sanction to borrow, among other amounts, £500 for electric lighting purposes.

London.—In discussing the financial relations of the local Borough Councils and the L.C.C., the Finance Committee of the latter body refers to the position created by the London Electric Supply Act of 1908, and deals with the formulation of a comprehensive policy for electricity supply in London. The Committee says:—

"It appears to us desirable that the Council should lay down some policy, and from one point of view the present time would seem not inappropriate for such action, inasmuch as there remain just 20 years between now and the earliest date by which the Council could purchase the companies' undertakings, and this period corresponds with the loan term allowed for generating plant. Hence any loans sanctioned for such plant after 1911 will be in respect of plant estimated to last until after the Council is empowered to purchase the companies' undertakings, and if the option to purchase is exercised, the Council will then be the authority for supplying electricity in London side by side with the Borough Councils. It would seem to be preferable, so far as the financial aspect of the question is concerned, for Borough Councils, where possible, as opportunity offered, to link up their undertakings for mutual support as well as for economy, instead of extending a number of comparatively small, and in some cases unprofitable, concerns which may, on economical grounds, some day have to be scrapped. It must, however, be borne in mind that no expression of opinion by the Council as to the policy which should be adopted would have any binding authority upon the Borough Councils who have established electricity undertakings, or upon the companies owning electricity undertakings. In any event, it is clear that while under existing conditions the Council might be able to give effect, to a limited extent, to any policy it might adopt as regards the undertakings of metropolitan Borough Councils, it would have no such power as regards the other undertakings. These considerations appear to us to point to the desirableness of an attempt being made to secure some agreement as to the future lines of development on the part of all electricity supply authorities in London, including companies as well as metropolitan Borough Councils."

A combined gas and electric lighting scheme for the City streets is understood to have been agreed on, and will be considered

by the Court of Common Council at an early date. Details of the scheme have not been published, but it is understood that centrally hung and bracket lamps will be generally adopted in preference to standard lamps, also that there will be an increase of nearly 50 per cent. in illumination with a considerable decrease in cost.

Islington.—The Lighting Committee reports to the effect that in August last it called the attention of the Council to the fact that the L.C.C. required the establishment of electricity testing stations within the borough. As a result of negotiations the L.C.C. agreed to the use of sub-stations, which will be constructed in connection with the extension of mains, as testing stations. The cost of connecting such sub-stations with the central station by means of pilot wires, and the provision of the necessary instruments is estimated at £2,400. The Committee has decided to make application to the L.C.C. for the borrowing of this sum.

Bermondsey.—The Electricity and Street Lighting Committee reports that, in connection with the Council's application to the L.C.C. for sanction to a loan of £18,563 for extensions to the electricity plant, the L.C.C. had asked to be furnished with information in as full detail as possible as to the terms which it is understood were offered to the B.C. for a supply of electricity in bulk by either or both of the two companies having powers of supply within the borough. While questioning the right of the L.C.C., the Committee had furnished the County Council with a copy of the report, showing that the offer of a supply in bulk had been exhaustively considered, and that no offer had been received which would in any way compare with the advantages and economy derived from plant extensions. The Finance Committee of the County Council was not satisfied with the details furnished, and stated that it had now decided to recommend the County Council to refuse to sanction the loan if the B.C. persisted in its refusal to supply the information asked for, but had postponed taking up this recommendation to the Council, in order to give the B.C. an opportunity to reconsider its decision. In the event of the County Council refusing to sanction the loan the Council has the right of appeal to the L.G.B. under Sec. 4 (1) of the London Government Act, 1899. It seemed to the Committee that the County Council misapprehended its true functions under the Metropolis Management Act, 1855, as a loan-sanctioning authority, and was endeavouring to control or dictate the policy of the Bermondsey Council in the administration of its municipal undertaking, and the Committee has decided to inform the County Council that it has been supplied with all the information necessary, and under these circumstances the Council does not see its way to furnish the additional details demanded.

Morley.—The T.C. has decided, by a majority of one vote, not to proceed further with the electric light scheme, which has been under consideration since last February.

Queensbury and Clayton.—These District Councils have been discussing the question of the advisability or otherwise of combined action with a view to obtaining a provisional order for the supply of electricity to their districts, and to transfer it to the Electrical Distribution of Yorkshire, Ltd., or otherwise. The two Councils have, however, decided to postpone consideration of the matter for 12 months, and in the meantime to make inquiries from Halifax and Bradford as to the terms upon which they would supply the districts concerned with electricity.

Rosyth (Fife).—The severe storm on Sunday did great damage to the electric installation at the works in connection with the new naval dockyard at Rosyth, Scotland. Practically every electric wire between the power station owned by the contractors and the various departments all over the works was brought to the ground by the hurricane. On the following day all the electrically-driven machinery was at a standstill—cranes, concrete crushers and mixers, and all the various workshop power installations.

St. Helens.—The electrical engineer to the Corporation has been requested to prepare a report on the question of the supply of energy for heating and cooking purposes.

Saltash.—The Devonport T.C. has been approached with reference to a supply of current for Saltash.

South Africa.—A recent issue of the *South African Mining Journal* describes the Kleinfontein central power station (Transvaal), built with the object of supplying energy to the New Kleinfontein Co., Benoni Cons. G.M., Ltd., Apex Mines, New Boksburg G.M., Ltd., and Rand Klip, Ltd. The plant generates three-phase current at 3,000 volts and 25 cycles, which is transformed up to 20,000 volts for overhead transmission to sub-stations at the various mines. The present plant consists of three 2,000-kw. Parsons turbo-alternators, but the lay-out provides for 20,000 kw. eventually. Six Babcock boilers of 30,000 lb. rated output, for 200 lb. pressure, with superheaters to give a steam temperature of 500° F., are installed in the boiler-house, with overhead bunkerage of 60 tons per boiler, supplied through a conveyor system from a 750-ton storage bunker. A 240-tube Green economiser with independent motor-driven scraper-gear is allotted to each boiler, while each set of two boilers is coupled to a steel chimney through a 30-in. motor-driven Sirocco fan. The output of this plant is controlled by Ferranti switchgear of the remote solenoid control type. Commenting on the above plant in a later issue, the same journal says that in a recent month, on a comparatively small output, the total costs, including interest, depreciation, &c., averaged 7·4d. per unit. When the Benoni supply is provided, it is expected that the figure will drop to 4·1d., and, of course, still further improvement will result as the plant is fully loaded. The chairman of the General Mining and Finance Co., Ltd., reported at the New Gooch meeting that the saving effected by the change from steam power to purchased electrical power was equal to 7·28d. per ton milled.

The reduction plant of the Brakpan mines is electrically driven by means of energy purchased from the Victoria Falls Co. The electrical supply is taken from two sub-stations situated on their main power line, one being situated at each of the two main shafts, partly at 2,100 and partly at 500 volts pressure. Electric power is used throughout the plant for all purposes, the aggregate power of motors installed or pending installation being approximately 10,000 H.P., and the proportion in which power is used for different purposes is as follows:—For mine pumping, 1,500 H.P.; main hoisting engines, 4,500 H.P.; stamp battery and tube mills, 1,950 H.P.; reduction works pumping plant, 1,000 H.P.; the balance being installed for sundry surface and reduction works plant. The whole of the power supply is distributed through underground cables of the paper-insulated, lead-covered and armoured type, of which some 28,000 ft. have been laid. The cables are laid as far as possible on a ring system, whereby supply to any point can be maintained through an alternative part of the system in the event of the breakdown of any particular cable. The surface lighting is carried out by means of overhead lines, and a large amount of lighting has also been carried out underground. Of the three main hoisting engines, two are of the direct-current type using Ward-Leonard control supplied by A.C. to D.C. motor-generators, and the third is plain three-phase with rheostatic control. The capacity of each hoist is 100 tons per hour hoisted from a vertical depth of 3,800 ft. For measuring purposes the total supply is divided into six main sections, the supply to each of which is separately metered, corresponding to the broad purposes of pumping, hoisting, milling, &c. These are further subdivided into some 27 pairs of feeders for separate metering, thus giving a close check on the total and individual consumption.—*South African Mining Journal.*

The surface equipment of the Modder B mine is electrically operated by over 6,000 H.P. of motors, including eight 50-H.P. motors for the stamps, three 40-H·P. motors driving gyratory crushers, five 100-H.P. motors direct geared to tube mills and various pump motors from 80-H.P. downwards, conveyor motors, &c. One single drum Ward-Leonard controlled winder does all the hoisting of ore.

A scheme for the electric lighting of Wynberg is under consideration. It may include the supply of power to private consumers.

Potchefstroom is falling into line with the general municipal activity which at present is characteristic of South Africa, the local authorities having decided to raise a loan of £32,000 to cover the cost of an electric lighting scheme and various other works.—*British and South African Export Gazette.*

South Shields.—At a meeting of the T.C. on the 2nd inst., the Electricity Committee recommended that a borough electrical engineer be advertised for at a salary of £400 per annum (without the privilege of taking pupils), in succession to Mr. J. H. Cawthra, who is going to South Africa. In moving the adoption of the report, Alderman Rennoldson, chairman of the Electrical Committee, said that although the Committee was not unanimous, the majority of the members thought the Council should advertise for an engineer at a salary of £400: so far as he was concerned, he would not be sorry if the Council decided to offer a larger salary in order to secure the best possible man for the position.

Stafford.—The T.C. has decided, subject to the payment of £1,250 by Messrs. Edwin Bostock & Co., Ltd., boot and shoe manufacturers, to lay an additional main to the firm's factory, where a much larger supply of current is required, at a cost of £2,500. The firm's contribution will be repaid, without interest, by way of rebates on accounts for current—viz., 25 per cent. if the annual account is £500 and upwards and 20 per cent. if the account is over £209 and less than £300.

Swindon.—On November 2nd, a L.G.B. inquiry was held into the application of the T.C. for a loan of £3,510 for a battery, boosters, switchgear and buildings. There was no opposition.

Thurlstone.—The U.D.C. has approved a plan submitted by the Yorkshire Electric Power Co., of a proposed electric power sub-station at Nether Mill for the supply of electric energy to various parts of the district.

Turton.—The electricity undertaking carried out by the U.D.C. in conjunction with the Lancashire Electric Power Co., Ltd., was inaugurated on November 2nd, when the current was switched on by the chairman of the Council, Mr. R. Ashworth, and 65 street lamps, each of 50 C.P., were lighted. The Council is taking current in bulk from the Power Co., and a number of private houses are being wired.

Warrington.—On the recommendation of the Electricity and Tramways Committee, the T.C. has decided to hire out arc lamps for outside shop lighting on basis of 670 hours' lighting per lamp per annum. Repayment of the capital cost of lamps and wiring will be spread over five years. When the matter came up for confirmation by the Council, Mr. Pemberton objected to the Corporation entering into competition with tradesmen, and expressed a hope that no one would apply for the lamps. In reply, Mr. Hawthorn said that private traders had had 11 years in which to supply the demand, and the time to object was when the Corporation Bill was before the House of Commons.

Walsall.—It is proposed to lay an alternating current main from Park Street along Station Street to Bridgman Street to enable a supply to be given to the L. and N.W. Railway, subject to the company consuming 50,000 units a year, which represents a revenue of £200.

Romford.—The Guardians have decided to take no further action with regard to the question of lighting the workhouse with electricity.

TRAMWAY and RAILWAY NOTES.

Bingley.—The District Council has unanimously decided that application shall be made to the B. of T. for prov. orders for the running of tramways on the main road through Bingley from Shipley, and for the supply of electricity for lighting and power purposes.

Bournemouth.—At the meeting of the T.C., the general manager of the tramways presented a report for the half-year ended September 30th. The total receipts were £52,199, as compared with £53,191 in 1910, and the expenditure was £28,892, as against £29,967 in 1910, while the gross balance was £23,307, as compared with £23,224 in 1910. The only increase in expenses was £405, and the decreases were :—Traffic expenses, £802 ; repairs and maintenance, £221 ; power expenses, £455 ; motor-'bus, £179.

Brighton.—At yesterday's meeting of the T.C., the General Purposes Committee presented a report on the railless trolley system, and on Hove's decision not to promote a Bill authorising railless traction in co-operation with Brighton. The Committee is of opinion that it is desirable that the Brighton Corporation should extend the proposed railless traction scheme westward, through the borough of Hove and the neighbouring urban districts of Portslade and Southwick to Shoreham, and that provision should also be made in the Bill for serving the existing omnibus route from Western Road, Hove, to Hove Station. The Committee is also of opinion that power should be taken in the Bill for the Corporation to run motor-omnibuses in connection with the tramway and railless traction system, and that the opportunity afforded by the promotion of the Bill should be taken to apply to Parliament for powers to expend a sum not exceeding the proceeds of a halfpenny rate in any one year upon advertising the attractions of the borough. The Hove Council has decided to fight the first proposal in every way possible, and as a last resort to secure similar powers for itself.

Continental Notes.—Austria.—The appearance of the French group associated with the Omnium Lyonnais in connection with the projected conversion of the Vienna City Railway, is producing some interest both in financial and electrical circles in that city. The group has submitted a proposal that the City of Vienna should raise a loan of £4,166,000 for the enterprise, and the company, which would work the railway, would pay 4 per cent. of the gross receipts as interest on the loan. Apart from financing the undertaking, the group would not concern itself with the conversion of the railway and the construction of the proposed new underground line, which would be left to the Austrian electrical firms. The scheme is declared to be unacceptable because it would not permit of the payment of the whole of the interest on the loan to be raised by the city. It is calculated in electrical circles in Vienna that the traffic receipts of the new railways would range from £1,250,000 to £1,458,000 per annum, and 4 per cent. would yield £50,000 to £58,300 to the city, whereas the interest charge on the loan would amount to £166,000 per annum. The question is, however, far from being ripe for settlement. The Siemens-Schuckert Co. and the A.E.G.-Union Co. are about to prepare a joint scheme and get into communication with the Traffic Commission on the matter. It is considered that the labours in this direction will extend over the whole of next year, by which time something definite should be known in regard to the financing of the undertaking. In any case, the sum of £4,166,000 estimated by the French group is regarded as much too low for the purpose of the conversion and the building of the underground line.

Germany.—A public service of electric motor-vehicles taking current from overhead conductors is about to be established between Neuhausen and Sending, near Munich.

Italy.—A preliminary concession has just been granted to the municipal authorities of Spalato in respect of a proposed electric railway between Spalato and Salona.

La Società per le Forze Idrauliche de la Maira, of Piedmont, is increasing its capital from £240,000 to £440,000 with the object of establishing a large central electricity station to utilise the water power of the River Maira in the Province of Piedmont. The new station will supply the electrical energy required for the railways in the Ligurta and Piedmont Provinces which the Italian State Railway authorities propose to electrify at an early date.

The Town Council of Rome has signed a contract for the building and working of an electric railway from Rome to Ostia with the representatives of the Metropolitan Co. of Paris. The railway will consist of two sections, one above ground from the sea to the Porta S. Paolo, the other underground from the Porta S. Paolo to the Piazza Venezia.—*Zeitschrift des Oest. Ingen. und Architekten Vereines.*

Dudley.—As a result of the recent accident on the tramways, considerable correspondence has taken place between the T.C. and the Tramways Co. A letter from the company states that the management is giving the very closest attention to the rolling stock with a view to securing as far as possible immunity from a recurrence of accidents such as the one which recently took place on the Castle Hill. The accident, it considers, was in no way attributable to lack of brake power. To increase security in this respect instructions have been given that all cars about to descend the Castle Hill are to come to a dead stop at a marked pole near the top of the gradient. With regard to Bath Hill, drivers ascending the gradient have been given instructions not to stop between Farthings Lane and Queen's Cross. The whole question of compulsory safety stops on the district system is being gone into by the general manager.

Guiseley (Yorks.).—The trackless trolley system appears to be making headway in the West Riding of Yorkshire, where, following upon its adoption by the Leeds and Bradford Tramway Committees, a private syndicate is said to have brought forward the proposal that Guiseley should be linked up with Otley and Ilkley by trackless system. It is said that a Bill is to be promoted in Parliament, and the Leeds Corporation has agreed not to offer any opposition, providing the Bill contains a clause requiring the completion of the works within three years, and subject to a satisfactory arrangement being first made between the Corporation and the promoters with reference to through fares from Leeds.

Heston and Isleworth.—At a special meeting of the U.D.C. a motion to receive a report of the General Purposes Committee to the effect that the Council should apply in the next session of Parliament for an Act, conferring, among other things (1) further electricity powers, and (2) the construction of railless traction routes in the district and the adjoining districts of Twickenham and Southall-Norwood, was negatived by 11 votes to 9.

Japan.—It is proposed by the Tokio municipality to issue bonds for £9,175,000 to purchase existing tramways, construct new ones, and for electric supply purposes.

Leyton.—The tramways manager reports having received an offer from Siemens Bros. Dynamo Works, Ltd., with regard to lighting the Council's tramway-cars with tantalum lamps. The offer is to lamp the 60 cars and maintain an average of 40 running cars for £9 per month for a one year's contract, £8 per month for a two years' contract, and for a three years' contract, £7 per month. The tramways manager reporting on this offer states that if the lamps were installed, in addition to having a better lighted car, an approximate saving of £14 for a one year's contract, £26 for a two years' contract, and £38 for a three years' contract, would be effected. In view of this report the Tramways Committee has decided to accept the offer to light the cars for a period of three years.

Manchester.—A correspondent informs us that an underground railway of over four miles long is contemplated ; the scheme is being engineered by Mr. James Welsh, of Manchester.

Marple.—At the monthly meeting of the U.D.C. on Monday, reference was made to the intention of the Stockport Corporation to promote a Bill in Parliament for providing a service of railless cars between Stockport and Marple. A petition, signed by 260 Offerton people, has been forwarded to their Council, and the Hazel Grove Council has passed a resolution in favour of the scheme. It is rumoured that railless cars are to run along the Macclesfield road. Mr. W. B. Hodgkinson said the Council had approved of the scheme, but it had a free hand as regards the details. Many residents of Marple did not favour the proposal. Those who work in Manchester and live in Marple say it will take away the picturesque rural appearance of the place and the tradesmen believe it will draw the trade to Stockport and cause a great decrease in the rateable value of Marple.

Matlock.—A conference has taken place between representatives of the Matlock and Matlock Bath Councils regarding another proposal to revive a scheme for a railless trolley service in the locality.

Rotherham.—The engineer has been instructed to prepare specifications, &c., for the purchase of nine new tramcars, and tenders are to be invited for the supply of same.

Ramsbottom (near Bury).—At a meeting of the U.D.C. to be held on the 16th inst., a resolution is to be moved that a Bill be promoted in Parliament for powers authorising the erection of overhead equipment, and all other works necessary or expedient for the installation and use of a system of railless electric traction.

St. Helens.—It has been decided to extend the tramway in Newton Road.

West Bromwich.—At the meeting of the T.C. on Friday last, the Mayor reported that at last a settlement had been arrived at with regard to the vexed tramway question, the agreement between the Corporation and the tramway company having been signed and sealed the previous day. The agreement, his Worship added, was fair for both parties. The Council had not taken any advantage, and had taken care that the company did not. He hoped the agreement would be faithfully carried out by both parties in its entirety.

West Hartlepool.—At a meeting of the T.C. on October 31st, the resolution that the Council give notice to purchase the portion of the Hartlepool tramway that is within the borough was formally confirmed.

Wolverhampton.—The Corporation Tramways Committee in its annual report to the T.C. presented this week gives the following statement of traffic receipts, &c., for the first six months of the financial year ending September 30th last, as compared with

the same period last year:—1911, 580,883 miles; 5,796,366 passengers; £26,732 receipts; 1910, 565,844 miles; 5,369,916 passengers; £24,916 receipts. It will be seen from the above figures, says the Committee, that the total revenue for the period referred to shows an increase of £1,815, or ·477d. per car-mile, whilst the car-mileage has increased by 15,039 miles. This satisfactory result is due to the exceptionally fine summer which we have enjoyed this year, and to the extra traffic on the occasion of the Coronation Festivities.

TELEGRAPH and TELEPHONE NOTES.

Correction.—In the "Empire Wireless" leaderette in our issue of 3rd inst. the last paragraph should read:—

"In the course of a Press Association interview, Mr. Charles Bright has called attention to the present position of affairs, and the *Daily Graphic* of October 30th stated that the prevention of monopoly was one of the legitimate functions of a Government."

The rest of the paragraph is our own comment on statements made by the *Daily Graphic* In the same article, by a printer's error, 180 million was reduced to 80 million words a year.

Pacific Cable Bill.—At the second reading of this Bill in the House of Lords on Tuesday last, the Earl of Liverpool said that its object was to enable the Pacific Cable Board to lay a cable between Australia and New Zealand, which would result in a saving of £6,000 a year by reduction of staff, besides facilitating communication.

Spain.—It is reported from Madrid that the Compania de Telegrafie sin hilos has been formed in that city to acquire the concession granted in 1908 to the Oerlikon Co. The capital amounts to £260,000, and comprises £100,000 in ordinary shares and £160,000 in preference shares. The directors are said to include Mr. Marconi, Mr. C. Isnes, a former Spanish Minister of Finance, and the manager of the Oerlikon Co. in Madrid.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—New South Wales.—December 20th. One branching multiple magneto switchboard at Broken Hill, for the P.M.G.'s Department. See "Official Notices" September 22nd.

Victoria.—November 28th. Ebonite earpieces, calculagraphs, and insulators for the P.M.G. See "Official Notices" October 6th.

December 12th.—Ebonite earpieces, telephone cords, bronze and copper wire, Bleeck-Love cells and charges, and telephone material, for the P.M.G.'s Department. See "Official Notices" October 20th.

Austria.—November 17th. The Austrian State Railway authorities at Cracow are inviting tenders for an installation of electric lighting at the railway station at Nowy-Sacz.

Blackpool.—November 18th. Taking up and re-laying a short length of double-line tramway. Mr. J. S. Brodie, borough engineer, Town Hall.

November 29th.—One 1,500-kw. steam turbo-alternator, one barometric jet condenser, and one 800-kw. mixed-pressure steam turbo-generator, for the Corporation. See "Official Notices" to-day.

Bootle.—November 20th. Slack for the electric light station, for the T.C., for six and twelve months from January 1st. Electrical Engineer, Pine Grove.

Canada.—Lethbridge.—November 24th. Municipality. Power station equipment, comprising boilers, economiser, steam turbo-generator, condenser and sub-station equipment; 10 per cent. deposit with tender. Plans, &c., from A. Reid, superintendent engineer, Lethbridge.

Chatham.—November 14th. Incandescent electric lamps for a year, for the T.C. Chas. Day, Borough Surveyor, Town Hall.

Dublin.—November 21st. Electric lighting and fire-signalling apparatus for the new Fire Brigade station, Thomas Street, for the Waterworks Committee. Specification for lighting (7s. 6d., not refundable) from the City Electrical Engineer, and for the signalling apparatus (4s. 6d., not refundable) from the Chief's Office, Central Station, Tara Street, Dublin.

Edinburgh.—Tenders are invited for an electric light installation at Tynecastle Supplementary School. J. A. Carfrae, architect, 3, Queen Street.

India.—November 14th. The Secretary of State for India is inviting tenders for rails and fishplates and electric cranes, &c. Director-General of Stores, India Office, Whitehall, S.W.

London.—L.C.C.—November 14th. The Tramways Department is inviting tenders for sand drying and crushing plant. A. L. C. Fell, Chief Officer of Tramways, 62, Finsbury Pavement, London, E.C.

November 18th.—Various stores and materials for the Port of London Authority, including: Item 27, carbons for electric arc lamps; Item 28, electric lamps (carbon filament). Stores Superintendent, 106, Fenchurch Street, E.C.

New Zealand.—February 7th, 1912. Napier Corporation. (1) Permanent way, overhead work and supply mains; (2) power station, car-shed and repair-shop equirments; (3) rolling stock. Deposit 2½ per cent. Specifications can be seen at the Board of Trade Commercial Intelligence Branch in London.

Norway.—January 31st, 1912. The Norwegian military authorities in Christiania are inviting tenders for the supply of 100 sets of field telephone apparatus.

Salford.—November 27th. Two 1,000-kw. direct-current turbo-generators, for the Corporation. See "Official Notices" November 3rd.

Sheffield.—November 13th. One 5,500-kw. steam turbine, condensing plant, pumps, pipework, &c., and alternator and exciter, for the Corporation. See "Official Notices" October 13th.

Siam.—December 30th. Tenders are invited for five electrically-driven centrifugal pumps for the waterworks at Bangkok. Particulars, Local Sanitary Department, Bangkok.

Stretford.—November 13th. Electric mains and accessories, for the U.D.C. Mr. R. Rowland, electrical engineer (returnable deposit of £2 2s.).

Swindon.—November 22nd. One 250-kw. Diesel oil engine generating set, accessories, switchgear, &c., for the Corporation. See "Official Notices" November 3rd.

Uruguay.—February 6th, 1912. Tenders are invited by the Port Authorities at Monte Video for the supply of 13 electric cranes, together with 600 metres of steel rails. For further particulars, see this column for October 27th.

Warrington.—November 17th. Telegraph materials and carbons, for a year, for the Cheshire Lines Committee (form No. 6). Stores Superintendent, Cheshire Lines, Warrington.

West Ham.—December 4th. Electric light installation at the Gainsborough Road Schools, for the Corporation. See "Official Notices" to-day.

CLOSED.

Amesbury (Wilts.).—The tender of Messrs. Grossmith and Co. has been accepted, at £998, for the electric light and power installation at the isolation hospital. The highest tender was £1,394 (Edmundson's Electricity Corporation, Ltd.).

Atherton (Lancs.).—The D.C. has accepted the tender of the Brush Electrical Engineering Co. to supply two single-phase, core type, oil-cooled transformers, each having a capacity of 30 k.v.a.

Cardiff.—The tender of Messrs. Stothert & Pitt, Ltd., has been accepted for one 3-ton and three 1-ton electric jib cranes, for the Great Western goods yard, at Newtown, Cardiff.

Dundee.—The T.C. Tramway Committee has approved of the acceptance of the offer of the Railless Electric Tramway Construction Co. for the supply of two 20-h.p. railless trolley cars for the Clepington Road district of the city. The estimated cost of the cars is £700 each. The overhead equipment and poles are to cost £1,258. The railless route will extend to 1¼ miles.

India.—The *Indian and Eastern Engineer* understands that the Tata Hydro-Electric Power Supply Co., Ltd., have placed the following orders in connection with their Bombay hydro-electric scheme, a 30,000-h.p. plant:—

Dynamos.—Messrs. Siemens.
Turbines.—Escher, Wyss & Co.
Switchgear and transformers.—General Electric Co., of New York.

It is also understood—but the report requires confirmation—that the pipe-line order will be placed with Messrs. Escher, Wyss & Co.

Largs.—Mr. J. A. Robertson, Corporation electrical engineer, Greenock, in a report to the T.C., recommends the refuse destructors offered by the Horsfall Co. (£2,587) and by Messrs. Heenan & Froude (£2,967). Mr. Robertson was asked to draw up a specification placing the two firms on a similar basis and to ask them to tender again. Of the seven offers submitted to Mr. Robertson, the lowest was £1,100 and the highest £2,967.

Leyton.—The U.D.C. has accepted the tender of Mr. R. R. Todd, at £249, for the supply of one mile of ·2 sq. in. distribution cable. Nine tenders were received, the prices ranging from that of the accepted to £405. Three of the tenders submitted were not in accordance with the specification.

St. Helens.—The Electricity Committee has ordered an additional feeder panel from Messrs. Ferranti, Ltd., and has accepted the tender of the Sutton Heath and Lea Green Collieries Co., Ltd., for 12 months' supply of fuel.

London.—L.C.C.—The Highways Committee received the following tenders for plant, &c., required for the new sub-station to be erected at Vauxhall :—

ONE 20-TON OVERHEAD TRAVELLING HAND-CRANE.

John Smith (Keighley), Ltd.	(recommended)	£259
Herbert Morris & Bastert, Ltd.		260
Holt & Willetts		265
James Spencer & Co.		290
Carrick & Ritchie, Ltd.		305
London Hoist and Machinery Co.		318
S. H. Heywood & Co., Ltd.		359
Thos. Smith & Sons		555

HIGH-TENSION ELECTRIC CABLES.

Siemens Bros. & Co., Ltd.	(recommended)	£9,762
W. T. Henley's Telegraph Works Co., Ltd.		9,898
Callender's Cable and Construction Co., Ltd.		10,062
British Insulated and Helsby Cables, Ltd.		10,070
Western Electric Co., Ltd.		10,188
Johnson & Phillips, Ltd.		10,504
W. T. Glover & Co., Ltd.		11,104
Foote & Milne, Ltd.		12,148

LOW-TENSION ELECTRIC CABLES.

Western Electric Co., Ltd.	(recommended)	£15,162
Callender's Cable and Construction Co., Ltd.		15,401
W. T. Henley's Telegraph Works Co., Ltd.		15,500
Johnson & Phillips, Ltd.		15,522
Foote & Milne, Ltd.		15,611
British Insulated and Helsby Cables, Ltd.		15,801
Siemens Bros. & Co., Ltd.		16,208
W. T. Glover & Co., Ltd.		16,808

ROTARY CONVERTERS.

Dick, Kerr & Co., Ltd.	(recommended)	£6,089
General Electric Co., Ltd.		6,149
British Westinghouse Electric and Manfg. Co., Ltd.		6,185
Ditto	(alternative tender—not to specification)	6,002
British Thomson-Houston Co., Ltd.		8,240
Ditto	(alternative tenders—not to specification)	5,848 / 6,161 / 6,260
Electric Construction Co., Ltd.		8,307
Bruce Peebles & Co., Ltd.	(not to specification)	14,646

The estimates of the chief officer of tramways comparable with the tenders are £300, £9,800, £15,300 and £6,300 for the overhead crane, high-tension cables, low-tension cables and rotary converters respectively.

The Metropolitan Water Board has accepted the following tenders in connection with the new pumping station and engines at Walton :—

Siemens Bros. Dynamo Works, Ltd.—One 5-B.H.P. motor for opening valves, £89.

General Electric Co.—440 yards of twin circular vulcanite hard-core cable, $\frac{7}{16}$ diameter, to connect electric pumps, £27 15s.

Gwynnes, Ltd.—One 4-in. Invincible pump and one special starting panel, for lifting out drainage water and natural-filtration water from the valve pit, £76.

The Board has further accepted the tender of the British Insulated and Helsby Cables, Ltd., at £75 17s., for the supply of two miles of V.I.R. cable with steel drawn-wire centre, required for repairs to the telephone at Hampton station.

Stafford.—The T.C. has accepted the tender of Callender's Cable and Construction Co., Ltd., for the provision and laying of 3,000 yd. of cable, at £2,010.

Swindon.—The T.C. has accepted the tender of Messrs. J. H. Holmes & Co. for a traction booster, at £327.

Torquay.—The T.C. has accepted the tender of Messrs. Whiteway & Ball for the supply of 3,000 tons of Featherstone pea slack coal and 800 tons of house coal screenings for the Electricity Department.

Uxbridge.—The Hospital Joint Board has placed the electric lighting and underground cable work of the fever and diphtheria blocks of the Isolation Hospital with Messrs. G. Weston and Sons, Ltd.

Walsall.—The Corporation Electricity Committee has accepted the tender of the British Westinghouse Co. for supplying two transformers, at £88, and switchgear, at £121, required in connection with the supply to Messrs. John Russell & Co.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—COL. H. M. LEAF.

The following orders are issued :—

Monday, November 13th.—"A" Company. Lecture by Major Le Rossignol on "Switchboard and Paralleling Dynamos." Company work, 7 to 9.30 p.m.

Tuesday, November 14th.—"B" Company. Same as "A," above.

Wednesday, November 15th.—Gymnastic classes, 7 to 10 p.m.

Thursday, November 16th.—"C" Company. Lecture, 7 p.m. Technical work and infantry drill, 8 to 10 p.m.

Friday, November 17th.—"D" Company. Lecture, 7 p.m. Technical work and infantry drill, 8 to 10 p.m.

Saturday, November 18th.—Social Club annual dinner, at 7.30 p.m., at the Café Monico.

There will be a week-end mobilisation camp at Dover for "A" and "B" Companies, leaving Victoria Station at 1.30 p.m. on Saturday, December 9th.

(Signed) P. H. CAMPBELL, Capt. R.E., Adjt. L.E.E.

FORTHCOMING EVENTS.

Institution of Electrical Engineers (Birmingham Local Section).—Friday, November 10th. At 7 for 7.30 p.m. At the Grand Hotel, Birmingham. Annual dinner.

Physical Society.—Friday, November 10th. At 5 p.m. At the Finsbury Technical College. Papers on "Physiological Effect of an Alternating Magnetic Field," and "Demonstrations of Acoustical Experiments, New and Old," by Prof. S. P. Thompson, and other papers.

Institution of Post Office Electrical Engineers (Metropolitan Centre).—Monday, November 13th. At 6 p.m. At the I.E.E. Paper on "Departmental Contracts," by Mr. W. S. Mountain.

Institution of Civil Engineers.—Tuesday, November 14th. At 8 p.m. Papers on "Loch Leven Water-Power Works," by Mr. A. H. Roberts, and "The Hydro-Electric Plant in the British Aluminium Co.'s Factory at Kinlochleven," by Mr. F. B. Sonnenschein.

Institution of Electrical Engineers (Scottish Local Section).—Tuesday, November 14th. At 8 p.m. At 207, Bath Street, Glasgow. First meeting of the session.

Institution of Electrical Engineers (Manchester Local Section).—Wednesday, November 15th. At Liverpool. Joint meeting with the Liverpool Engineering Society. Paper on "The Function of the Laboratory in the Training of an Engineer," by Prof. E. W. Marchant.

Royal Society of Arts.—Wednesday, November 15th. At 8 p.m. First meeting of the session. Opening address by Lord Sanderson.

Institution of Electrical Engineers (Students' Section).—Wednesday, November 15th. At 7.45 p.m. First meeting of the session. Opening address by Mr. C. P. Sparks.

Institution of Electrical Engineers (Yorkshire Local Section).—Wednesday, November 15th. At 7.30 p.m. At the Hotel Metropole. Inaugural address by Mr. T. Harding Churton, followed by a smoking concert.

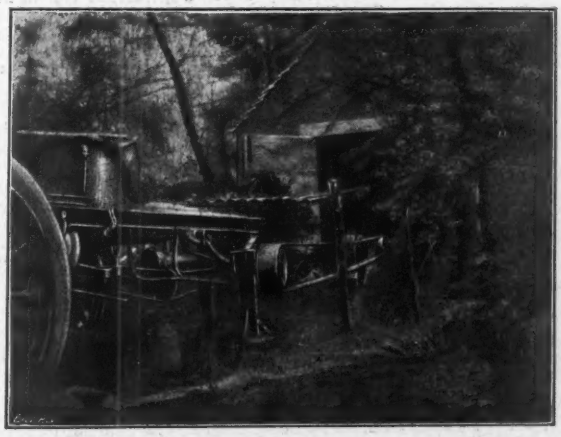
Illuminating Engineering Society.—Friday, November 17th. At 8 p.m. At the Royal Society of Arts. Report on progress during the vacation, and paper on "Notes on the Design of Motor-Car Headlights," by Dr. H. R. B. Hickman.

Northampton Institute Engineering Society.—Friday, November 17th. At 5.45 p.m. Paper on "The Design of Electric Power Stations," by Mr. A. H. Perrett.

Junior Institution of Engineers.—Saturday, November 18th. At 3 p.m. Visit to the works of the Tottenham and Edmonton Gas Light and Coke Co.

NOTES.

Emergency Stand-by Plant.—Some 11 years ago a water-power plant was installed at the residence of Col. Hopton, of Canon-Ffrome Court, Herefordshire, the plant being an interesting one, as it is water-driven from the River Ffrome on a rather low fall. The turbine is one of Messrs. Gilbert Gilkes's manufacture, with a horizontal wheel and a vertical shaft, the drive being from the turbine fly-wheel, which is horizontal, to the dynamo pulley, which is vertical. The current is transmitted about ½ mile to the battery room, which is situated close to the mansion. The output of the plant is about 12½ H.P., and during the 11 years the plant has been installed there has been no shortage of water until this year; but owing to the extreme drought of the past summer, the last month caused a good deal of anxiety, and the short supply of water necessitated some means of getting over the difficulty. At Col. Hopton's suggestion, a



OLD STEAM CAR DRIVING DYNAMO

White steam car, which he had ceased to use for road work was brought into operation. With great difficulty this car was got into position outside the turbine house and blocked up on wood brackets; one of the back wheels was removed, and in place of this a belt pulley was put on, the other hind wheel being allowed to rest on the ground, so as to prevent it running through the differential. The White steamer was found to be able to carry the load continuously for 12 hours at a stretch; giving 40 to 50 amperes at 150 volts, and running on cheap petrol, the consumption was a gallon an hour. Owing to the fact that the car was a fixture, the condensing plant had to be disconnected, as there was not sufficient cool air to condense the steam, and the exhaust pipe was carried to the atmosphere. The water tank capacity without the condenser was capable of running the load for about an hour at a time. The engine was capable of driving the dynamo, which is, of course, shunt wound, on the lights direct without a variation of 2 per cent. in the voltage.

Electrical Contractors and Electrical Inspectors.—On November 2nd, 1911, at the Clerkenwell Police Court, before Mr. Bros, an application was made by Mr. R. Tweedy Smith (solicitor to the Electrical Contractors' Association, Incorporated), on behalf of Mr. A. Edward Evans, of 38, Fitzroy Street, Fitzroy Square, and also on behalf of Messrs. McDonald, Syer & Co., Ltd., of 295, Gray's Inn Road, W.C., for the appointment of an electrical inspector under the terms of the provisional order obtained by the St. Pancras Borough Council in the year 1883. Mr. Tweedy Smith explained to the Magistrate that the right of appointing an electrical inspector in London was vested in the County Council, with the exception of two areas, namely, St. Pancras and Chelsea. The right of the Magistrate to appoint an inspector in St. Pancras was given to him by Sec. 28 of the provisional order of 1883. The Magistrate, however, had no power under the order to insist upon the electrical inspector testing anything except the mains of the undertakers and the meter of the consumer. This defect he, however, contended had been remedied by the Board of Trade regulations which had been issued since the date of the order, and Regulation 31 provided that any consumer who was dissatisfied with the action of the undertakers in refusing to give or in discontinuing a supply of energy to his premises had a right to apply for the installation to be tested by an electrical inspector. By Sec. 6 of the Electric Lighting Act, 1882, a Board of Trade Regulation has all the effect of an Act of Parliament in varying any provisional orders. It was explained to the magistrate that the two applications were somewhat different. In the case of Mr. Evans, he had some 60 lights in his house and factory. In the factory he had a 7½-H.P. motor, and four radiators in his house and two in the office. It appeared that a Tucker fuseboard had been provided for some of the radiators, and that the engineer, Mr. Baynes, had refused to connect this fuseboard on the ground that it did not comply with a notice he had issued. Such notice was on the back of the form signed by consumers for the supply of electricity, and was headed "Terms and conditions of supply." The particular provision referred to was that "all main fuses shall be of the enclosed cartridge type built up of porcelain. If other types are used, a clear break or not less than 4 in. must be provided for main fuses, and 3 in. for sub-fuses." Mr. Baynes had got the impression that he could insist upon a particular type of fuse, notwithstanding the fact that all other engineers in the Metropolitan area were accepting the same fuseboard he was rejecting. Mr. Tweedy Smith informed the magistrate that there had been several faults on the undertakers' mains resulting in the lamps of consumers being burnt out, and that really what the engineer was trying to do, was to protect the consumer's premises from the leakages from the undertakers' mains. The engineer, on the other hand, by his own Provisional Order, Sec. 59 *d* and *g*, was bound to observe the following regulations:—"The supply of electricity to any premises shall be capable of being turned off at some point outside such premises. All service lines and positive and negative poles of service lines upon the premises of any consumer shall be at a distance of not less than 3 in. from one another respectively." The Corporation of St. Pancras were not complying with such provisions, but were insisting upon a larger break in fuses, really to guard against the defects in their own mains. The Tucker fuseboard in question had been passed by the Board of Trade, and the application was now that the Magistrate should appoint an Inspector to examine the same fuseboard and installation at Mr. Evans's premises, and also to test the meter at the premises of Messrs. McDonald, Syer & Co., and the mains of the Corporation of St. Pancras.

Mr. Syer gave evidence to substantiate the statement of his solicitor. The Magistrate, who had heard Mr. Barrington Ward's contention on behalf of the Borough Council at the previous hearing, then stated that he was of opinion that he ought to appoint an electrical inspector. Mr. Ward, counsel for the Corporation, applied to the Magistrate to adjourn the case for him to consider the arguments advanced by Mr. Tweedy Smith. The Magistrate thereupon adjourned the application until November 22nd at 2 o'clock.

Electrical Trade Union Lectures.—We are asked to state that the West London branch of the Electrical Trades Union are running, as is usual during winter months, a series of lectures on social science and the practical application of electricity. The next lecture is to be delivered by Mr. Clarke, of the Anti-Socialist Union, on "Socialism and Trade Unions," on Tuesday, November 14th, at 9 o'clock p.m., at the Bush Hotel, Shepherd's Bush Green, W. We understand that interesting questions and discussions are assured, and all engaged in the trade are invited to attend. Anyone wishing to join the branch is asked to write to Mr. W. J. Webb, 98, Coomer Road, Fulham, S.W.

Tube Railway and Omnibus Co.'s Amalgamation.—On Monday, Mr. Martin asked the President of the Board of Trade whether he was aware that an amalgamation of the London General Omnibus Co., the Metropolitan District Railway Co., and the Underground Electric Railways Co. was being arranged, and whether he would introduce legislation similar to the Sherman Anti-Trust Law of the United States of America to protect the public against combinations intended to prevent competition in railway rates? Mr. Buxton replied that he had seen it stated in the Press that some such arrangement was under consideration. The recent Departmental Committee on Railway Amalgamation recommended, *inter alia*, that the Railway and Canal Traffic Act of 1894 with regard to increase of railway rates should be extended to cover passenger fares, and the Government hoped to introduce a Bill next session to deal with the matters covered by the recommendations of the Committee.

Post Office Engineering Department.—On Wednesday last week, Mr. Steel Maitland asked the Postmaster-General whether it was proposed to change the headquarters of the Engineering Department of the Midland District of the Post Office from Birmingham to Nottingham, and if so, what were the reasons for the change?—The Postmaster-General replied that the superintending engineer's headquarters would be moved from Birmingham to Nottingham, as part of a general arrangement for assimilating the districts of the superintending engineers to those of the surveyors. Such an arrangement was highly expedient for the smooth and efficient working of the service, and was especially necessary in view of the forthcoming transfer of the National Telephone Co.'s undertaking to the Post Office. The change would be made at once. The telegraph and telephone interests of Birmingham would in no way suffer, and the growth of the stores staff at the Birmingham depôt would probably before long quite make up for the removal now contemplated.—Mr. Amery asked if it was proposed also to divert the stores centre now at Birmingham, the great headquarters of the National Telephone Co., which were shortly to be taken over, and the main underground cables which were at Birmingham, in the centre of the great industrial area, which they served at present.—The Postmaster-General said there was no proposal to alter the cable route, and the stores department at Birmingham was more likely to expand than contract.

Post Office Stores Department.—Mr. Alden in the Parliamentary Papers asked the Postmaster-General whether the report of the Committee appointed early in 1910 to inquire into the working of the factories department of the Post Office would be published, and, if so, when; whether he was in a position to give any information regarding the recommendations of that Committee; whether he could say on what date these recommendations would be brought into force; whether he was aware that, although the existing clerical staff of the factories department was declared redundant on March 4th, 1910, the official policy to be pursued in disposing of that staff had not yet been definitely declared; and whether he could now state how the redundant staff would be disposed of.—The Postmaster-General replied that the Committee had reported, and the report was now under his consideration. He feared that he could not, at the present moment, make any statement with regard to the recommendations of the Committee or with regard to the publication of the report.

Will.—The *Times* states that Mr. William Shuter, late chairman of the Telegraph Construction and Maintenance Co., Ltd., who died on October 3rd, aged 82, left estate of the gross value of £43,720, with net personalty £41,604.

The Telegraph Construction Bill.—In the House of Lords on Monday this Bill, which enables the Postmaster-General to take over telegraphs constructed across railways and canals, was read a second time. The *Times* report says that all the great trunk railways had agreed to the measure with the exception of two Scottish companies.

Wages at South Kensington Generating Station.—In the Parliamentary Papers, Mr. Tyson Wilson asked the First Commissioner of Works if he had received a complaint that the engine drivers and their assistants employed at the South Kensington generating station were being paid considerably less than the standard rate of wages; and, if so, what steps had he taken in the matter. Mr. Dudley Ward replied that while the First Commissioner was not prepared to admit that the engine drivers and their assistants employed at the South Kensington generating station were being paid considerably less than the standard rate of wages, he was giving the matter his careful consideration, and hoped shortly to be in a position to arrive at a decision.

Copper.—The copper situation at the end of October, as summarised in Messrs. Merton's statistical circular, shows no marked change in general features. Visible supplies have dropped 5,504 tons, 1,300 tons of which represents a decrease in the quantity afloat from Australia. This decrease is high, but in accordance with the tendency to reduce European stocks. Supplies from the United States to English ports and Havre are low; to other European ports just average. From Spain and Portugal supplies are distinctly low. Shipments from Chile are down, and Australia shows about 500 tons below the average. Deliveries, on the other hand, are up to the usual quantity, hence the larger withdrawal from stocks.

American stocks increased 3,328 tons during September, and the world's visible supply for the end of that month, therefore, shows an increase of 3,754 tons over the quantity returned for the end of August. This figure was 130,239 tons higher than it has been since the end of June, 1911.

During October stocks in Rotterdam fell 350 tons, and those in Hamburg are estimated to have decreased 900 tons.

Imports and Exports in October.—Our foreign trade during last month showed substantial increases in all three sections—imports, exports and re-exports.

Imports advanced by £2,804,498 as compared with October, 1910, but electrical goods dropped by £24,351 to £131,249. Machinery advanced by £75,752 to £430,881.

Exports advanced by £5,855,071, of which yarns and textile fabrics account for about £3,000,000, the rest being spread over practically all departments, both manufactured and unmanufactured. Electrical goods are better by £49,837 at £296,016. Machinery advanced by £257,602 to £2,908,435.

Re-exports have increased by £673,546.

(*Continued on page* 789.)

THE COMMONWEALTH EDISON CO.'S NEW POWER STATION.

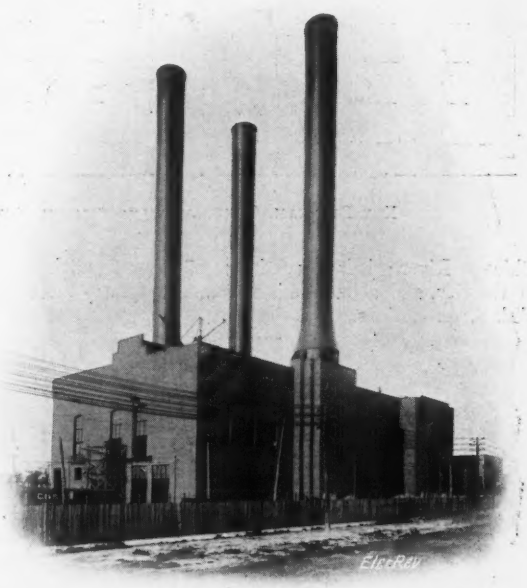
The electrical progress of the city of Chicago needs but little introduction to our readers; an immensely thriving business and manufacturing centre, with a population of over 2¼ millions, it is already well known for its Fisk Street and Quarry Street power plants of the Commonwealth Edison Co., with their large Curtis turbine units, as also for the Chicago drainage-canal power project. With the opening of a third large power station by the Edison Co.—the new North-West Station—Chicago may almost claim to lead the way in such matters, as the plant will be unique in the matter of the large units to be installed there. The new North-West Station will be linked with the Fisk Street and Quarry Street plants, and in all of them steam-turbine units are used exclusively.

The first 5,000-KW. Curtis vertical turbine ever built was the basis of the design of the well-known Fisk Street station, and was started-up in 1903.

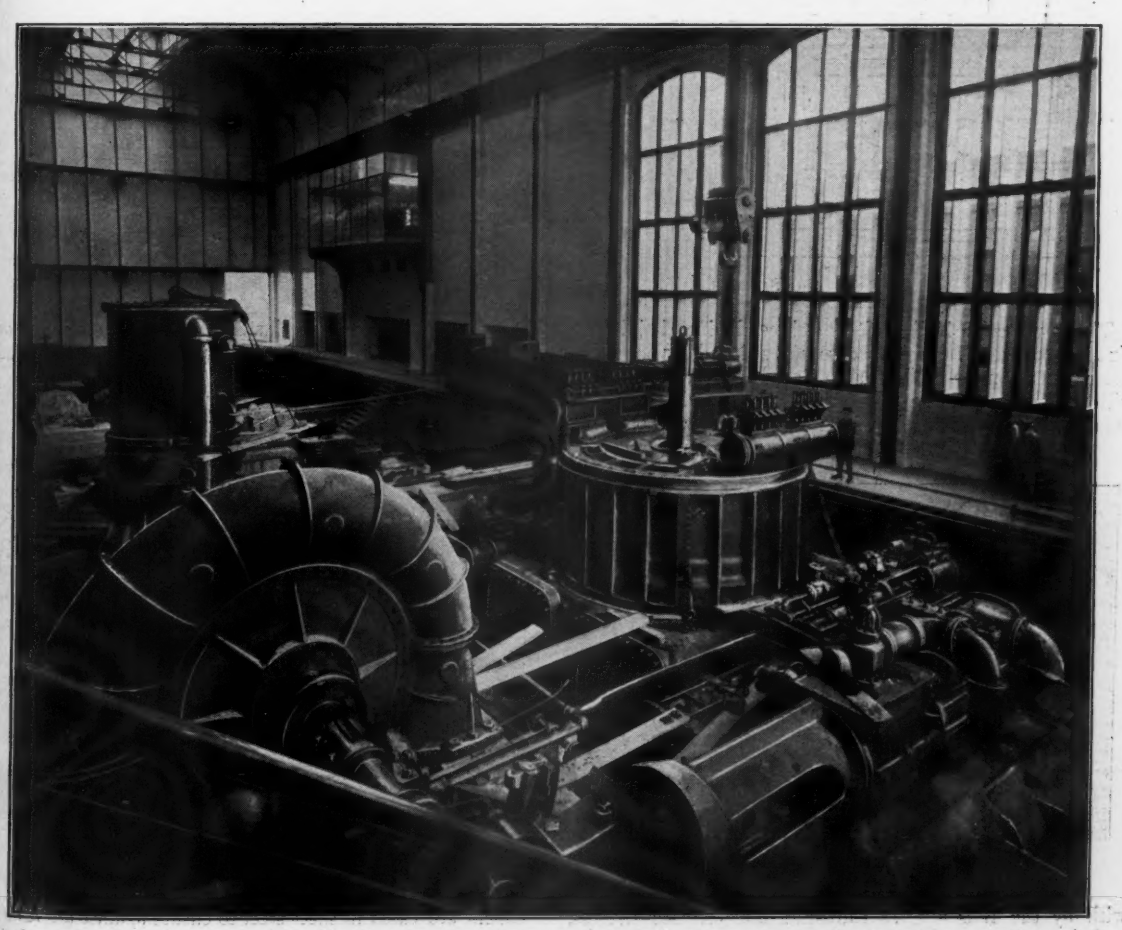
This unit was followed by three similar ones, and six Curtis units of 12,000 KW. each, continuous rating—the four early 5,000-KW. units being subsequently replaced by another four sets of 12,000 KW. each, making a total of 10 similar Curtis units aggregating 120,000 KW. Then followed the Quarry Street station with six 14,000-KW. Curtis turbine sets, and now comes the North-West plant with an initial equipment of two 20,000-KW. units, which are the largest turbo-generators ever built.

In a period of about eight years, therefore, the total steam-turbine capacity of the company has increased to 18 units of 244,000 KW.—a figure of which they may well be proud.

The new station will, moreover, contain ultimately six 20,000-KW. units, and the plans anticipate a duplicate station alongside, with a similar capacity, making a total of 240,000 KW. on the North-West site.

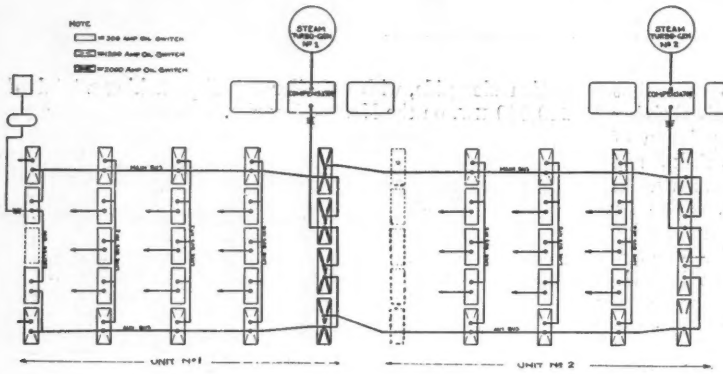


THE NEW NORTH-WEST POWER STATION, CHICAGO.



INTERIOR OF ENGINE ROOM; FIRST 20,000 KW. SET DURING ERECTION.

The site comprises 110 acres, and is served by the Chicago & North-Western Railway and north branch of the Chicago River; it is situated some 7 miles from the centre of the city, and about 8 miles from the Quarry Street and Fisk Street stations.



Key Diagram, Generator and Switch Connections.

two outer tracks also run in this basement, under the ash bunkers, for dealing with the ashes.

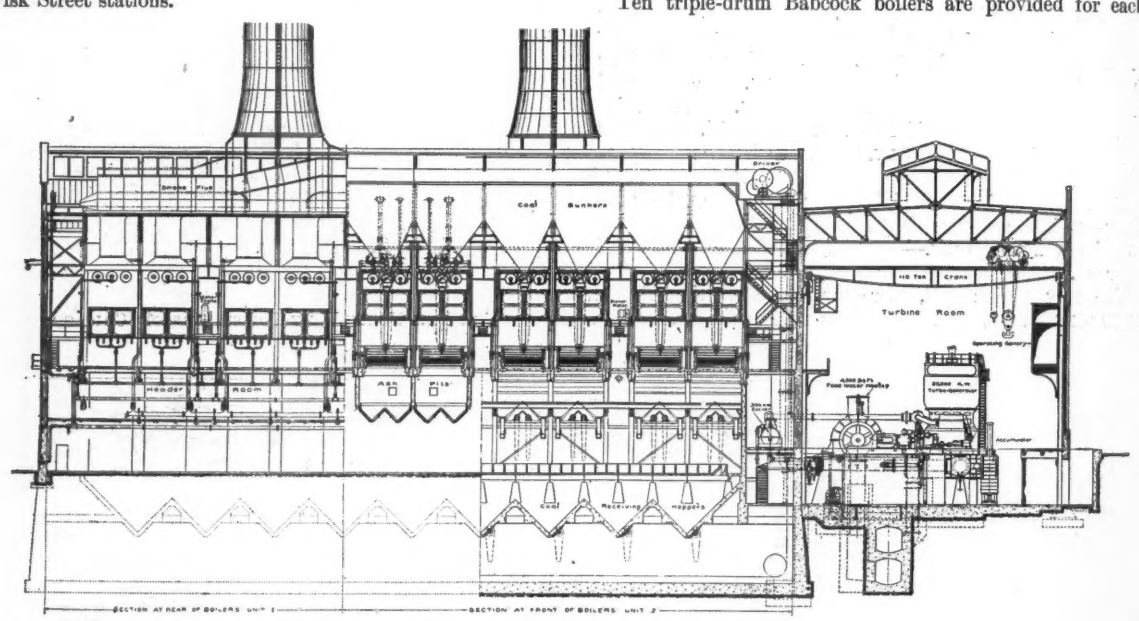
A travelling coal-handling crane with a grab bucket spans the coal tracks for emptying cars with no hopper bottoms; cars with hopper bottoms discharge directly into coal-receiving hoppers below, holding 75 tons for each boiler.

Below the hoppers is a second basement, with a travelling coal crusher spanning a 34 in. × 36 in. bucket conveyor, which encircles vertically the entire double boiler section and feeds overhead coal bunkers of a capacity of 63 tons per boiler.

The bunker capacity thus amounts to 1,400 tons for each unit of 10 boilers, but outside storage between the twin stations will give accommodation for 250,000 tons in addition.

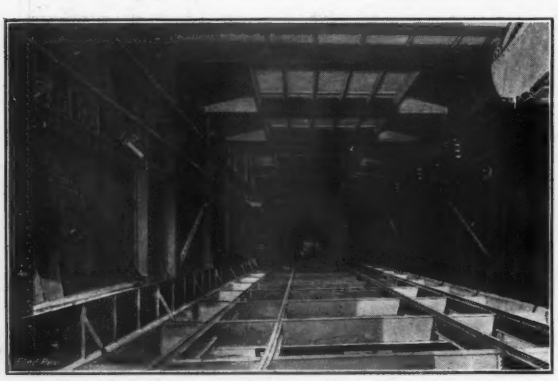
The boiler house floor is 21 ft. above that of the turbine room, permitting the boiler operator to have an unobstructed view of the latter.

Ten triple-drum Babcock boilers are provided for each



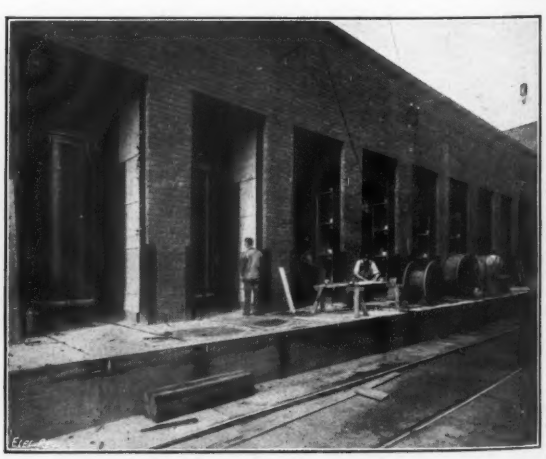
Sectional View, North-West Station, Chicago.

The new station is divided into three distinct buildings, viz, the boiler and turbine house, the switch house and the transformer house—all these are of steel frame construction, with brick walls, concrete foundations, coal receiving hoppers, tunnels, &c. Fuel entering from the railway will be dealt with by the Edison Co.'s third-rail 600-volt locomotives, and shunted into two inner tracks running under the boilers;



Coal Tracks and Hoppers under Boiler House.

20,000-kw. turbine unit, installed in two facing rows and subdivided into batteries of five boilers each. These boilers are cased in sheet steel to ensure against air leakage, and are equipped with chain grate stokers; each ten boilers



The Transformer House.

discharges into a 17-ft. dia. brick lined steel stack rising to 250 ft. above the boiler house floor.

The boiler pressure is 250 lb. with 150° superheat; a 6-in. steam pipe from each boiler connects to a 16-in. main header in the basement for each turbine, and the headers for Nos. 1 and 2 units are interconnected by a 10-in. loop which also supplies pumps and auxiliary plant; a duplicate system of boiler feed pumps, turbine driven, is provided for each unit, also service and fire pumps, in a pump room in the basement.

The turbine room runs across the end of the boiler houses as is usual nowadays where large units are installed.

The two 20,000-KW. units to be initially installed each consist of a 4,500-volt, 25-cycle, three-phase alternator mounted on a five-stage 750-R.P.M. Curtis turbine with a condenser in the base and under the turbine room floor; later on some 60-cycle generators will be installed.

A special ventilating system is provided for the alternators, which, by means of fan blades round the top of the rotors, suck cool air through metal ducts from the basement, discharging it downwards through the machine and thus neutralise heat radiation from the top of the turbine.

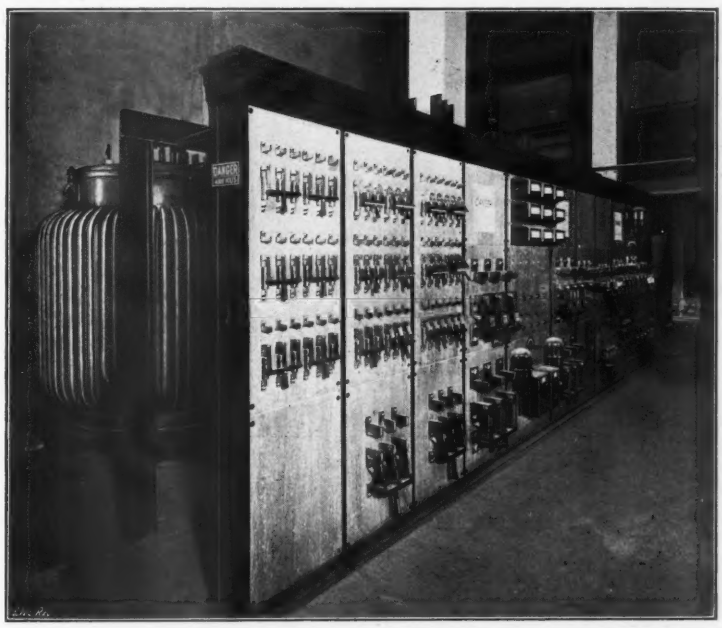
These turbine units stand 27 ft. above the floor, are 15½ ft. greatest diameter and are spaced on 44 ft. centres. A 300-KW. steam-driven, and a 200-KW. motor-driven exciter are provided for each unit; the former is a turbine set, while the latter is operated from the 9,000-volt system through an oil-cooled transformer stepping down to 220 volts.

A railway track extends along one wall of the turbine room and a 110-ton Morgan crane spans the latter.

The condenser circulating system is of interest; a crib with motor-driven revolving screens has been provided for the intake water which flows in a tunnel under the discharge tunnel to near the river, where the two tunnels diverge.

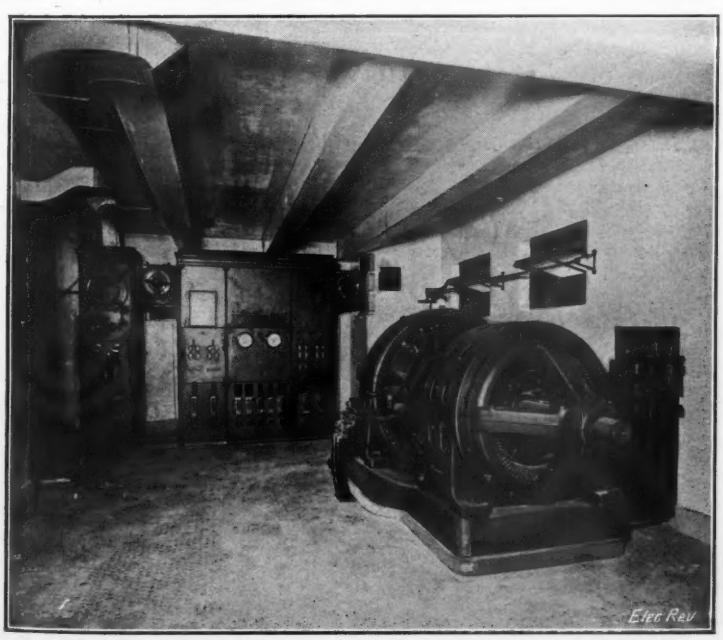
The circulating system deals with 210 gallons per unit per second. The turbine step bearings are supplied with oil under 1,200 lb. pressure by two pumps per unit with an accumulator plant; a second oil supply is also provided, from two pumps, circulating oil at 100 lb. per sq. in. to the upper bearings and turbine governors.

The lay out of the switchgear comprises an operating house of three floors overlooking the turbines, and connected by a passage leading over the transformer house, to the switch-house beyond, the last mentioned being a three-floor building.



Distributing Board in Sub-station.

The transformer and switch houses are parallel to the engine room. The generator leads—two per phase—and a neutral cable are led down the ventilating duct and run to auto-transformers in the transformer house. The field leads are similarly carried down the ventilating duct and led to the exciter board on the first floor of the operating house, being connected to 125-volt bus-bars. The generator field rheostats are motor-operated, the resistances being on the second floor of the operating bay and the contact heads on the top panel of the switchboard; the field leads are connected with double-pole solenoid-operated circuit-breakers. Two emergency excitation batteries are provided, each comprising 70 cells and two end-cell switches; also a third battery for operating the oil-switch controls.



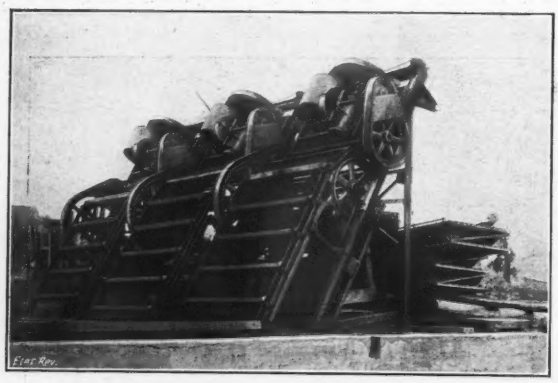
Exciter Set and Switchboard.

The third floor of the control bay contains bench-boards for controlling the generator switches, and vertical panel-boards for controlling the feeder switchgear.

The lead-covered cables from the generators connect to three 3,333-K.V.A. auto-transformers per unit for raising the generator pressure from 4,500 to 9,000 volts. The transformers are oil-insulated and water-cooled, with forced circulation; each occupies a separate fireproof compartment, and stands on a truck which can be run on to an unloading platform and transferred to the railway for repairs.

Special oil-filling, filtering and emptying arrangements are provided. The neutral cable of each generator and the neutrals of the auto-transformers connect to a bus-bar in the transformer house, which is coupled through an oil switch with another bus-bar, which latter is earthed through a resistance of about 2½ ohms.

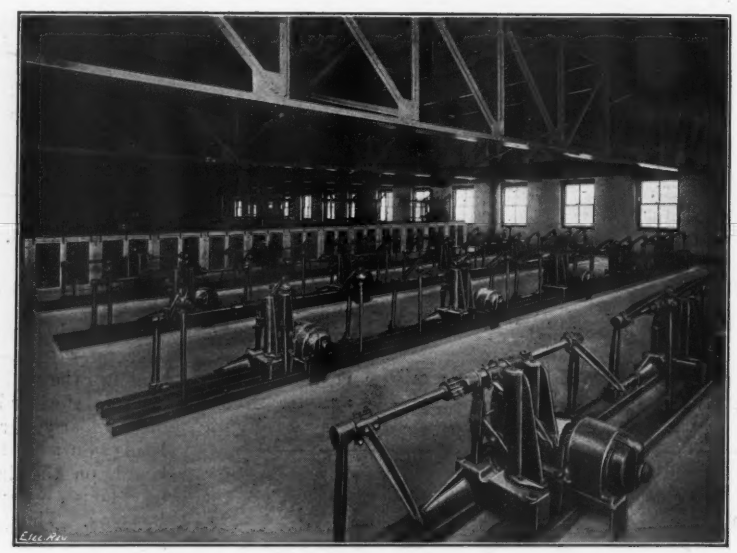
The 9,000-volt transformer leads entering the switch house are connected by 2,000-ampere oil switches to main and auxiliary bus-bars; interconnecting 2,000-amp. oil switches



Revolving Screens, Circulating Intake.

are provided for coupling the main and auxiliary bus-bars of each generator unit, and these bars are connected through 1,200-amp. oil switches to four line bus-bars running at right angles, each line bus feeding three 300-amp. feeder oil switches, and thus making a group of twelve 300-amp. feeder switches per generator unit.

The bus-bars, instrument transformers, &c., are located on the first floor of the switch house, mounted in concrete compartments; the second floor contains 19 oil switches for each unit, the oil pots being in single, instead of double, rows, as commonly arranged; the third floor contains all the operating mechanism of the switches, slightly raised above the floor, except for the generator and interconnecting switches. This arrangement safeguards the mechanism in case of a burn-out below.



Switch-house Floor, Containing Oil-switch Mechanism.

The control switchboards consist of black slate panels; miniature painted wood busses, mounted on the bench boards in connection with pilot lamps, indicate the connections and condition of the system to the switchman. At one end of the switch-house a sub-station is provided, containing light and power transformers; all the lamps—about 2,000 incandescent and 50 arc—and approximately 900 H.P. of station induction motors are supplied by 60-cycle, 115-230-volt circuits, from four 750-KW. three-phase oil-cooled transformers, which, in turn, are energised by a 12,000-volt 60-cycle line from Quarry Street station, and another from the Whipple Street sub-station. As a reserve, six 100-K.V.A. transformers, fed from a 4,000-volt service, are installed.

A feature of interest is a testing set for testing generators, switches, lines, &c.

This consists of a motor-generator set, comprising a 500-K.V.A. generator direct-driven from a 220-volt, 200-KW. motor with an exciter coupled to the shaft.

This supplies 300-volt current to a step-up transformer with series and shunt resistance connected in each phase for the purpose of obtaining a good sine wave. The transformer has an output of 500 K.V.A. at 20,000, 40,000 or 60,000 volts.

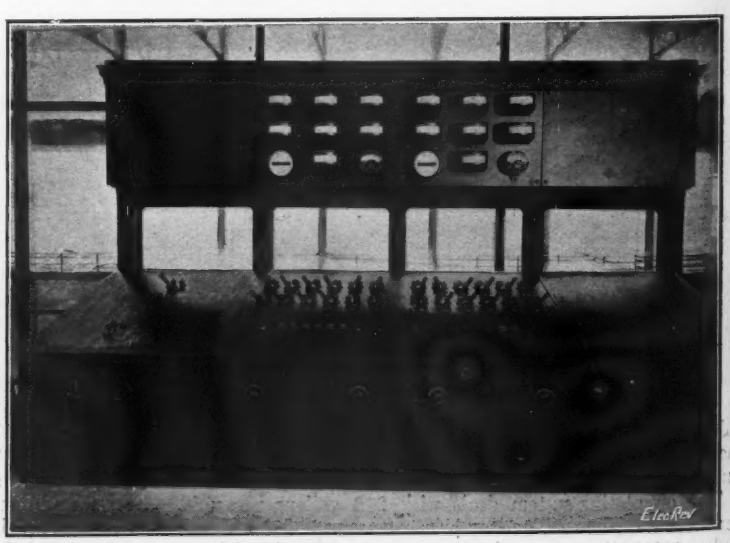
The high-voltage terminals of the transformers are connected with links and switches for obtaining the various pressures desired; the shunt resistances are fixed with a capacity of 100 amperes, while the series resistances are variable with a capacity of 1,000 amperes; a lead-covered, three-conductor cable runs to the second floor of the switch-house terminating in cabinets containing plugging equipment for extending the test leads to the oil switches.

The new station is to start with 15 outgoing lines, three of them connecting to the Fisk Street plant; the bulk of the station output, however, is intended for the north-west section of the city, where there is a rapidly increasing load.

The steam equipment was designed by Sargent & Lundy, consulting engineers, while the Commonwealth Edison Co. were responsible for the electrical arrangements.

In conclusion, we are indebted to our American contemporary the *Electrical Review and Western Electrician* for the above details of the plant, also for kindly placing at our disposal the various illustrations which are included.

The Electrical Contractors' Association and Sales Departments.—With a view of testing the legality of the establishment of an electrical sales department by the Sunderland Corporation, local electric traders and contractors have decided to apply to the High Court for an injunction to restrain the Corporation from continuing this competition. It is stated that the action is to be taken through the Electrical Contractors' Association.



Generator Control Board.

NOTES.

(*Continued from page* 784.)

The British Fire Prevention Committee.—The winter session of this Committee was commenced last week with a meeting to conduct a series of fire tests dealing with a small hand extinguisher intended to put out electrical and petrol fires. There was a large attendance at the Committee's Regent's Park testing station, the Earl of Londesborough, K.C.V.O., Mr. Alexander Siemens, M.Inst.C.E., and Mr. Edwin O. Sachs, F.R.S.Ed., members of Council, receiving the visitors, among whom were leading officials concerned in fire matters from the War Office, Board of Trade and other public departments, also Sir George Hastings, Sir Wm. Bell, LL.D., and others interested in the subject. The Committee's usual offic al report will be issued in due course. The testing arrangements were under the direction of Mr. Percy Collins, J.P., F.S.S., Mr. Ellis Marsland, Mr. Dyer, Mr. Wylson, F.R.I.B.A., and others, composing a sub-committee of ten. In December some fire-resisting doors and partitions from the United States will be under investigation.

A Peculiar Russian Lighting Concession.—One of the most extraordinary lighting concessions ever placed on record has recently been granted by the Municipal Council of Moscow to a Belgian company for a term of years expiring in 1945. The company, which bears the title of the Centrales Electriques, is actually seeking to raise from £1,000,000 to £1,200,000 to carry out an undertaking, the ownership and working of which would at any time be absolutely at the mercy of the city authorities. It is necessary to mention, in the first place, that the Electric Lighting Co. of 1886 of St. Petersburg already possesses a station in Moscow, in addition to other stations in the Russian capital and in Lodz, and the Moscow works had a turnover of 28,480,000 KW.-hours in 1910, the consumers' connections representing 43,466 KW. The company, which has no monopoly in Moscow, has felt unable or unwilling to meet all the wishes of the Municipal Council, which, consequently, decided to secure the establishment of a competitive undertaking. A competition was instituted, and resulted in applications being made by two Belgian companies, two French electrical companies and a Russian firm, but, with the exception of the Centrales Electriques—to which the concession was awarded—the other four rivals withdrew when they became acquainted with the draconic conditions which the Municipal Council sought to impose. It is, indeed, astonishing that anyone was found willing to agree to the terms which, it is stated on good authority, provide that on the establishment of the works, at the cost of the concessionaire, all the installations, including site, network of mains, &c., immediately pass into the possession of the city, so that the concessionaire only becomes the usufructuary. As a consequence, in those cases in which the concession can be declared forfeited on the basis of the penalty conditions, the holder would not only lose the right of working, but also the whole of the works apparently without the payment of compensation. The plans for the initial works and of subsequent extensions have to be submitted to the council for approval, but if the alterations required by the latter are not carried out, the city is empowered to dissolve the contract, when the deposit of £110,000 to be lodged up to the starting of supply, and all the works already completed would devolve upon the city without any indemnity being paid. It is also stipulated that the supply company must carry out extensions of mains to a distance of 400 yards from mains already laid, for any connection without any guarantee of a minimum consumption of current. It would therefore be possible to compel the company to constantly proceed with extensions where there would be absolutely no prospect of any return, and where even the city is unwilling to lay gas mains in consequence of inadequate sales.

The concession prohibits, under pain of forfeiture, the conclusion of any understanding with the Electric Lighting Co. of 1886, in regard to areas of supply, prices, &c., and in general, the non-fulfilment of any one of the material conditions would enable the city to set aside the contract and become the possessor of the undertaking. No guarantees are provided against an improper use being made of this right, and no appeal to arbitration or the ordinary Courts is foreseen. The conditions in respect of the charges to be made for lighting are also very peculiar. After the early or transition period, when the price will be somewhat higher, the maximum charge has been fixed at about 4d. per KW.-hour, with rebates, whilst the rate to be charged to the city may be lowered to one-half of that amount, and if the cost of production is largely decreased in another large city, the supply price is to be reduced in Moscow! The rate of the existing company is 7½d. per KW.-hour, although this is subject to rebates, whereas the lowest in Russia is declared to be in operation at Odessa, where 6½d. per KW.-hour is the rule. The new company is to pay from 7½ to 12 per cent. of the gross receipts to the city in return for the concession, an amount which, taken in conjunction with the maximum price—is thought to render the commercial prospects of the undertaking very unfavourable, especially as the cost of installation and working in Russia is said to be 80 per cent. more expensive than in the West of Europe, owing to the import duties and the various expenses, which are high. It should be added that on the expiration of the concession in 1945 the whole of the undertaking becomes the property of the city free of charge, although this would appear to be the case from the beginning, as previously mentioned. It is almost impossible to understand how any company could be found willing to agree to conditions which are of such a partial character, and which would deprive the holder of any freedom of action in the working of the concession, more especially when it is known that the Moscow City Council is simultaneously approaching the Duma for sanction to establish municipal electric supply works which are proposed to be worked in conjunction with the existing power station which supplies the tramways in the city. The promoters of the new scheme for Moscow do not appear to meet with much financial encouragement in Belgium, and it is considered that German financial institutions, which are also interested in Russian electrical enterprises, will likewise manifest reserve towards the project. If, however, it should be possible to raise the capital required for the undertaking, the fact will act as an incentive to other Russian cities to seek to impose similarly onerous conditions upon promoters, and at the same time hamper the development of central station work in Russia on a financially sound basis.

The Olympia Motor Show.—While a visit to the Motor-Car Exhibition at Olympia reveals the fact that, for the first time, not a single electrically-propelled vehicle is displayed, an inspection of the galleries shows that the ever-increasing popularity of the automobile is finding a large amount of work for the smaller branches of electrical engineering. In the production of magnetos for ignition purposes various manufacturers have shown great ingenuity, while the fact that electric lighting is rapidly displacing the older means of illumination by oil and acetylene lamps has led to the introduction of quite a number of interesting and specially-designed dynamos suitable for installation on motor-cars. In one case, the arrangement is being utilised for the starting of the engine.

The London Chamber of Commerce and the National Insurance Bill.—At a special meeting of the Engineering Section of this Chamber, held on Friday last, the terms of this Bill, especially Part 2 relating to Unemployment, were considered. Reports were presented showing the amendments which had been tabled on the suggestion of the Chamber, which the Section generally approved. The following resolution was unanimously adopted on the motion of Mr. E. W. Petter, seconded by Mr. W. A. Walber (chairman of the Metal Trades Section of the Chamber):—

"That in the opinion of this meeting the effects of the National Insurance Bill, if passed into law, will be to make competition at home and abroad with foreign production increasingly difficult or impossible for English producers, and by its effect on wages increase the cost of living and labour unrest; and, further, in the opinion of this meeting it is manifestly unfair to put a tax upon employers for the purpose of providing against unemployment, which tax, when added to the cost of production, must tend in itself to bring about that unemployment for which the Act is supposed to provide a remedy, and this meeting earnestly requests H.M. Government to allow further time for consideration of the effects of the Bill upon manufacturing trades, and particularly urges that Part 2 or Unemployment Section should, before being passed into law, form the subject of a Royal Commission before which evidence of employers as to the effect upon their respective trades may be taken.

"That copies of this resolution be forwarded to the President of the Board of Trade, the members of the Grand Committee, all members of the Section, and the general and trade Press."

In the course of the discussion it was pointed out that the condition of the engineering trades was such—owing to the relatively small profits earned by many of the firms and companies, especially the smaller concerns—that the cost of unemployment insurance, in addition to that for sickness, would materially reduce the margin of profit. A case was mentioned where an engineering undertaking employing 1,500 men, which had been struggling for the last five years to pay its way and was approaching a remunerative stage, would be seriously handicapped by the new charges under the Bill as a whole. Reference was also made to the difficulties which would arise in regard to contracts entered into prior to the introduction of the Bill, against which contingency no provision had been made. Another criticism was that no allowance is made for the fact that in certain parts of the country there is invariably a week's holiday each year, so that continuous employment of 52 weeks would not occur, and the employers would therefore apparently be debarred from the reduction for continuous employment allowed under the Bill. The meeting also considered that it was contrary to public policy to give power to the Insurance Commissioners and the Board of Trade, with the approval of the Treasury, to bring other classes of trades than those scheduled within the benefits of this part of the Bill, without direct authority from Parliament, and those present were of opinion that any such extension of the schedule should not be made except under the direct sanction of Parliament or by a provisional order.

Proposed London Industrial Employers' Federation.—We are informed that, as a result of a circular letter issued in September by some London manufacturers, being members of the Council of the London Waterside Manufacturers' Association, a number of manufacturers of London and district have expressed themselves in favour of a federation of London industrial employers, the objects of which would be mutual defence in instances of strike trouble, to prevent unfair picketing, and generally for co-operation with regard to labour difficulties; also the formation of a Parliamentary Committee. The Council of the London Waterside Manufacturers' Association met on Tuesday, October 24th, and unanimously resolved that preliminary steps should be taken to promote a federation, and a special committee was appointed, consisting of Mr. Alexander Siemens, Mr. L. A. Martin, Mr. F. C. Hill, Mr. Alfred

Brooks and Mr. J. Carr, with power to convene a meeting of those London manufacturers who have expressed approval of the idea. The Committee have now called a general meeting for Tuesday, November 21st, at 2.30 p.m., at the Abercorn Rooms, Liverpool Street Hotel, E.C., to consider a number of draft resolutions constituting the federation. Our readers who are interested in the matter can obtain further particulars from Mr. C. Taylor, London Waterside Manufacturers' Association, 1, Oxford Court, Cannon Street, E.C.

Institution and Lecture Notes. — Institution of Electrical Engineers.—At the opening meeting of the Session of the Institution of Civil Engineers last Tuesday evening, a deputation consisting of Mr. S. Z. de Ferranti, President of the Institution of Electrical Engineers, Mr. R. K. Gray, Past-President, Messrs. W. Duddell, F.R.S., W. H. Patchell, J. F. C. Snell, and Major W. A. J. O'Meara, C.M.G., Vice-Presidents, Mr. Robert Hammond, Hon. Treasurer, and Mr. P. F. Rowell, Secretary, presented to the Council and members of the Institution of Civil Engineers an illuminated address of thanks, as follows, on behalf of the Institution of Electrical Engineers:—"We, the President, Council and Members of the Institution of Electrical Engineers, desire hereby to express to the Institution of Civil Engineers our deep sense of gratitude for the privilege so generously granted to us from February, 1872, to April, 1910, of holding the ordinary meetings of this Institution, more than 500 in number, in the Hall of the Institution of Civil Engineers. The hospitality extended to us during this long period of 38 years has conferred a material and lasting benefit on the development of the electrical profession, and will always be held in our memories with sincere appreciation and thankfulness."

Royal Society of Arts.—This Society begins its session on Wednesday, November 15th, with an address from Lord Sanderson, G.C.B., the chairman of the Council. At the meetings to be held before Christmas, papers will be read on "The Industrial Progress of America," by Prof. James Douglas, LL.D.; on "London Transport," by Mr. W. Yorath Lewis; and other subjects. Four Cantor lectures on "The Carbonisation of Coal" will be delivered by Prof. Vivian Lewes, and two Juvenile lectures on "Soap Bubbles" will be given in January by Mr. C. V. Boys, F.R.S. A long list of papers for the meetings to be held after Christmas is also published. It includes the following:—

H. A. Roberts, M.A., "The Relations of Science to Commerce and Industry."
E. K. Scott, "The Manufacture of Nitrates from the Atmosphere."
Charles Bright, "The Administration of the Imperial Telegraphs."
Prof. G. W. Osborn Howe, "Recent Progress in Radio-Telegraphy."
Dr. Leonard Hill and Martin Flack, "The Influence of Ozone in Ventilation."

Royal Institution.—The Christmas course of juvenile lectures this year will be delivered by Dr. P. Chalmers Mitchell, F.R.S., on "The Childhood of Animals."

Junior Institution of Engineers.—At the recent annual general meeting, Mr. W. T. Dunn was elected chairman, and Messrs. S. Bylander and P. L. Young vice-chairmen.

On the 15th inst., at 6 p.m., a lecture on weights and measures and the metric system will be given to the members of the London Association of Accountants. Admission is by ticket, for which no charge is made.

The Delhi Durbar Illuminations.—The *Times*, in referring to the preparations for displays of fireworks and illuminations in the various cities which the King and Queen will visit in India, says that Messrs. James Pain and Sons have been commissioned by the Indian Government and municipal authorities to provide fireworks both day and night at the Delhi Durbar and to illuminate the city at a cost of £3,000. Calcutta will be illuminated with 10,000 prismatic lamps and electric glow lamps. The Government buildings will be decorated with draperies and floral designs, and the city with flowers, flags and triumphal arches. A firework display will be given on the Maidan at a cost of £2,500, and the illuminations and decorations will cost £10,000. At Rangoon Messrs. Pain will illuminate the islands with 200,000 prismatic lamps and 15,000 Oriental lanterns. Bombay will be lighted by nearly 50,000 lamps. Altogether Messrs. Pain's contracts amount to nearly £30,000.

Municipal Co-operation with Private Enterprise.—A scheme is being promoted in Bavaria for the establishment of a large power station for supply in bulk and to large industrial consumers. It is proposed to form a company with a total capital of £400,000, of which 51 per cent. would be subscribed by the municipal authorities of Nuremberg, 24 per cent. by the municipal Council of Fürth, and 25 per cent. by the Schuckert Electricity Co. and its Bavarian banking institutions. The undertaking would deliver a supply in bulk to the existing stations in the two towns in question, the Nuremberg tramways, the Franconia overland central station in Ansbach, the Siemens-Schuckert works in Nuremberg, and other large works in that town. It is intended to proceed with the enterprise independently of the projected utilisation of the water-power of the Walchen lake, although, if the latter is carried out, the former would be held as a reserve station.

Appointments Vacant.—Electrical engineer for the South Shields Corporation electricity undertaking (£400); clerk for the Maidstone Corporation tramways department; shift engineer for the Colchester electricity department (£2). See our advertisement pages to-day.

Educational Notes.—On October 25th an important extension of the Bradford Technical College was opened, consisting of a large block devoted to experimental textile work. The new section includes a power station equipped with a suction gas engine of 125 H.P., a compound steam engine of 200 H.P., a high-speed vertical engine of 75 H.P. and a turbine of 75 H.P. The turbine is coupled to a three-phase alternator, and each of the other engines to a dynamo. The boiler house contains a 30 × 8 ft. boiler, superheater and economiser. The plant supplies light and power to two other buildings besides the new section.

Physical Society's Annual Exhibition.—This Exhibition will be held on Tuesday, December 19th, and will be open both in the afternoon and evening.

Fire.—On Tuesday night a serious fire occurred at Mazda House, 77, Upper Thames Street, E.C., the new building of the British Thomson-Houston Co., Ltd. The premises had lately been fitted up for the purposes of the company's business, and an additional floor had been put up on top. From the reports in the Press, we gather that three floors were destroyed, only the lower portion of the building being saved, and business is being carried on there with the least possible delay.

Osram Week.—The war of electric lighting against gas will be carried right into the enemy's camp next week—*Osram Week*. The G.E.C. are conducting a big advertising campaign, making use of great dailies throughout the kingdom to create the personal interest of electricity consumers in Osrams and Osram lighting. The scheme also includes the principal wholesale houses and local traders. The latter will be making a special shop-window display of Osrams.

B. of T. Report on Lewisham Accident.—Lt.-Col. von Donop has now reported on the overturning of an L.C.C. car near Lewisham High Road on September 2nd. The car was descending a gradient on a curve, at moderate speed, when it jumped the track, and after travelling a short distance, fell on its side. The Inspector attributes the derailment to the sudden locking of the wheels by the hand-brakes, and momentary stoppage caused by the application of the magnetic brake, in conjunction with the movement of the live load to the outside of the curve under centrifugal action, which would cause the car to tilt, lifting the "near" side wheels off their rails. The "off" side wheels then left the track, and the car, gradually heeling over, ran on until obstructed by another tramway track, which caused it to fall completely on its side.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Mr. G. F. Gregory, of Darlington, has been appointed second engineer-in-charge at the Ilford electricity works.

Mr. J. Pilling, borough electrical engineer at King's Lynn, has, it is understood, accepted the position of managing director of a local company formed to take over and re-open the St. Nicholas Ironworks, at Lynn.

The Southampton T.C. has decided to increase the salary of Mr. H. L. Mills, assistant electrical engineer, from £250 to £260 per annum, rising by £10 a year to £300.

Tramway Officials.—The salary of Mr. A. B. Slater, manager of the Burton-on-Trent Corporation Tramways, is to be increased from £150 to £175 per annum.

General.—The *Australian Mining Standard* states that Mr. A. G. H. May, M.I.E.E., who is the electrical engineer and manager of the Wonthaggi (V.) electric lighting scheme, has been appointed to the position of resident engineer for Victoria of the Inverell Light and Power Co.

The same exchange says that Mr. A. H. Wood has resigned the position of electrical engineer and director to the Toora (V.) Electric Light and Power Supply Co.

The *Indian and Eastern Engineer* states that Mr. Beames, the new chief electrical engineer for Mysore, arrived from America and took over charge from Mr. Gibbs, now of the Tata Hydro-Electric Power Co., of Bombay, at the end of September.

Mr. E. Dormann, A.M.I.E.E., chief engineer of Aron Electricity Meter, Ltd., is leaving his present position next week in order to take up an important appointment in Sweden.

Obituary.—Mr. J. Dixon.—The death occurred very suddenly, on October 30th, of Mr. Isaac Dixon, who was for a long period in the engineering department of Messrs. Siemens Bros., Ltd., of Charlton, S.E. The deceased gentleman, who was in his 71st year, served on the Greenwich Borough Council for six years.

Mr. John Brown, F.R.S.—We regret to record that Mr. J. Brown, F.R.S., died in Belfast on November 1st. The deceased gentleman was the inventor of the viagraph for recording road surface inequalities. He was an A.M.I.E.E., and a Fellow of the Physical Society, and in 1902 he acted as local secretary in connection with the Belfast visit of the British Association.

Mr. J. Eagleston.—The death occurred on October 30th of Mr. Joseph Eagleston, B.A., who for many years up to 1909 had managed the business of Messrs. Eagleston & Son, electricians, St. Clement's, Oxford. He was 75 years of age.

NEW COMPANIES REGISTERED.

Switchgear & Cowans (1911), Ltd. (118,136).—This company was registered on October 19th, with a capital of £8,200 in £1 shares (3,000 preference), to carry on the businesses formerly carried on by the Switchgear Co., Ltd., and Cowans, Ltd., and those of electrical engineers, electricians, manufacturers of and dealers in electric apparatus and fittings, &c., and to adopt an agreement with J. E. Waller. The subscribers (with one share each) are:—J. E. Waller, St. Stephen's House, Westminster, S.W., consulting engineer; J. G. Statter, Springfield Lane, Salford, Manchester, electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are J. E. Waller (permanent director and chairman) and J. G. Statter; remuneration of J. E. Waller, £75 per annum; of other directors, £50 each per annum. Registered office, Springfield Lane, Salford, Manchester.

Cebu Syndicate, Ltd. (118,079).—This company was registered on October 16th, with a capital of £1,000 in £1 shares, to acquire or construct, work and turn to account any tramways, railways, telegraphs, telephone lines and electric, hydraulic and other works in the East Indies or elsewhere. The subscribers (with one share each) are:—J. W. Pollard, 6, Upper Mall, Hammersmith, W., clerk; W. Farrier, 524, High Road, Leyton, clerk. Private company. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first; qualification (except first directors, who require none) £10. Registered by Ashurst, Morris, Crisp & Co., 17, Throgmorton Avenue, E.C.

Allen & Grosse, Ltd. (3,736).—This company was registered in Dublin on October 16th, with a capital of £1,000 in £1 shares, to carry on the business of an electric light company in all its branches. The subscribers (with one share each) are:—G. Allen, Dundela Park, Belfast, electrical engineer; H. P. Grosse, 83, Fitzroy Avenue, Belfast, electrical engineer. Private company. The first directors are G. Allen and H. P. Grosse; qualification, 25 shares. Registered office, 35, Queen Street, Belfast.

Water, Gas and Power Undertakings, Ltd. (118,223).—This company was registered on October 25th, with a capital of £4,000 in £1 shares (3,000 preference), to construct, maintain, develop, work and control any waterworks, gasworks, reservoirs, roads, tramways, electric power, heat and light supply works, &c. The subscribers (with one share each) are:—A. F. Bell, 323, Brixton Road, S.W., gentleman; W. H. Herod, 17, Frinton Road, N., clerk. Private company. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first. Registered by Canwarden & Co., 37-39, Essex Street, Strand, W.C.

Dimming Switches, Ltd. (118,381).—This company was registered on November 3rd, with a capital of £20,000 in £1 shares, to carry on the business of mechanical and electrical engineers, electricians, &c., to acquire from the Midland Electric Manufacturing Co., Ltd., a licence to use and exercise an invention for improvements in current graduating devices or resistances applicable for electric lighting or heating. The subscribers (with one share each) are:—G. T. Thornhill, Craigmore Park Road, Moseley, manufacturer; H. Laidlow Downes, 1-3, Stanley Street, Liverpool, merchant. Private company. The number of directors is not to be more than five; the first are G. T. Thornhill, W. L. Barber and H. Laidlow-Downes; qualification, 100 shares. Registered by Jordan & Sons, Ltd., 116-117, Chancery Lane, W.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Power Accessories, Ltd. (97,862).—A memorandum of satisfaction in full on October 7th, 1911, of debenture dated March 16th, 1910, securing £150, has been filed.

Nottinghamshire and Derbyshire Tramways Development Co., Ltd. (75,397).—Issue on October 2nd, 1911, of £4,050 debentures, part of a series of which particulars have already been filed.

Corona Lamp Works, Ltd. (116,527).—Issue on October 10th, 1911, of £500 debentures, part of a series of which particulars have already been filed.

Footscray Electricity Supply Co., Ltd. (86,863).—Issue on October 6th, 1911, of £600 debentures, part of a series of which particulars have already been filed. (Previously issued of same series, £2,500.)

Anglo-American Electric Co., Ltd. (87,403).—Return dated August 24th, filed August 26th, 1911. Capital, £300,000 in £1 shares; all shares taken up; £7 paid; £299,993 considered as paid. Mortgages and charges: £300,000.

British Electric Traction Co., Ltd. (49,855).—Return dated June 29th, filed September 15th, 1911. Capital, £4,000,000 in 200,000 ordinary and 200,000 preference shares of £10 each; 138,501 ordinary and 161,437 preference shares taken up; £10 per share called up on 117,926 ordinary and 142,500 preference; £2,604,260 paid; £343,120 considered as paid on 15,375 ordinary and 18,937 preference. Mortgages and charges: £1,903,841.

CITY NOTES.

Edison & Swan United Electric Light Co., Ltd.

Mr. Henry Wolfenden presided on November 2nd, at Winchester House, E.C., over the twenty-eighth ordinary general meeting of the shareholders of the above company.

The Chairman, in moving the adoption of the report (see Electrical Review, page 709), said it was with somewhat conflicting feelings that he addressed the shareholders. On the one hand, the result of the year's trading had been fairly satisfactory, and they might congratulate themselves upon the improvement shown over the two previous lean years, the gross profit this year being equal to that of the previous two years added together. On the other hand, they regretted that they did not feel justified in recommending the payment of a dividend, although they had earned one. The reason was that they wished to conserve their resources for improving the business. The improved profit was due mainly to two causes, one being the increased volume of turnover and the other economy in production. Their endeavour was to cultivate a large and increasing business by producing economically and selling at a moderate rate of profit. That they had done a larger trade was shown by one figure in the year's balance-sheet—viz., under the heading of debtors, which were £67,103 against £55,900 in the previous year, an increase of £11,403, which was equal to about 20 per cent. Their desire was to continue this policy, and to carry it further. They proposed to extend their selling organisation gradually to countries abroad where they were not now adequately represented, and they hoped thereby to extend the demand for their manufactures. To meet this increased demand they must also be prepared to extend their manufacturing facilities if required. All this would be dealt with after due deliberation, and with care and watchfulness, but it implied the possible employment of more funds in stocks, working capital, and, perhaps, plant, and it was only to their internal resources, viz., their savings from profits, that they could look to provide these funds. Hence the large appropriation this year to the reserve fund, and the absence of a dividend on the present occasion. But they trusted this disappointment might be only temporary. He fully recognised the just claims of the shareholders to consideration, and he was not an opponent to paying dividends when earned. Next to the pleasure of receiving them was the pleasure of paying them, and when they met again a year hence, if they had, as they hoped, as good a report, or a better one, the question of dividend must, and would, receive proper consideration. Another reason for circumspection, although he did not lay undue emphasis on it, was the present position of the lamp industry. This was an important part of their business, and had for some years been passing through a period of transition, and even yet the state of transition, or evolution, might not have reached finality. Whatever the result, it would, no doubt, be for the ultimate good of the industry and consumers alike. But, in the meantime, they were gradually building up a reserve against a contingency which they hope may never arise, viz., any possible depreciation in the value of stock arising from changes in the type or methods of manufacture; and to the stock reserve this year they also made a liberal appropriation. Bearing on this question of stocks, they would observe that the figure under the head of stock and plant, showed an increase of £13,135. This increase was divided as follows:—Plant, £1,361; work in progress, £4,708; and the difference was due to lamps. The stock of carbon lamps continued to decrease. On the other side of the balance-sheet they would note that the amount of the second debenture stock outstanding as security for loans had been reduced from £100,000 to £70,000. This, of course, meant that they had repaid part of the loan, and he hoped that next year this line in the balance-sheet would have disappeared. Naturally, one would expect that on account of the reduction of loans, the amount owing to creditors would have diminished also, but the trade creditors had increased, for the same reasons that their debtors had increased, viz., a larger business, and consequently the total figure under the head of creditors remained practically unchanged. To sum up the year's situation, the whole of the profit made after payment of the debenture interest had been profitably employed in strengthening and extending the business. Since the close of the financial year they had maintained and perhaps improved their trading results when compared with the corresponding period of last year, and without venturing to prophesy as to what might happen in this world of change, he thought he might say their prospects were favourable for the current year. They had a good lamp to offer to their customers, and one which, in their opinion, was not excelled by any other on the market. They did not ask a higher price than their competitors. There was no part of their lamp which they did not make in England. It was essentially British made throughout, and under those circumstances he confidently appealed to the support of all British consumers, and he asked them when buying to demand the Ediswan lamp and see that they got it. By so doing they would be helping the company, and also would be acting up to their principles, whether Free Traders or Protectionists. As Free Traders they would be buying in the cheapest market, and as Protectionists they would foster British manufacture, and without desiring or intending to introduce controversial matter on that occasion, he said that both consummations were devoutly to be wished.

Mr. E. B. Ellice Clark seconded the motion, and the report was adopted without discussion.

The Chairman was re-elected a director, and the proceedings terminated.

Cape Electric Tramways, Ltd.

Mr. Ludwig Breitmeyer presided on Wednesday last week, at the offices, London Wall Buildings, E.C., over the fifteenth ordinary meeting of the shareholders of the above company.

In moving the adoption of the report, the Chairman said they would remember that at the meeting last year he expressed a strong belief that they had seen the worst of the dull times, and that in future they would be spared that acute depression for which their undertaking had suffered in the last five or six years. He was happy to say those anticipations had been realised. Their returns showed a marked improvement both for the Cape Town and Port Elizabeth systems. The passengers carried exceeded those of the previous year by almost four millions, with an increase

in the receipts of about £15,000, whilst the figures of the last few months since the close of their financial year on June 30th had shown still further advances. This satisfactory result enabled them to recommend the payment of a dividend of 2½ per cent. free of income-tax on the ordinary shares, besides placing £8.000 to reserve, and carrying forward the handsome profit balance of £8,574 to next year's account. After a lapse, therefore, of six years they had arrived at a dividend-paying stage. The beginning he must confess was modest, but for shareholders who might be impotent he had the consolation of saying that, in his opinion, they would improve upon the modest start, and be able to pay more in the coming years, because the prospects for the future were very encouraging. Every measure that could be devised to increase the revenue of the company had the careful attention of the directors. On the advice of the management they had decided to install a motor-'bus service in Cape Town, and a few 'buses were now being built, and were expected to be at work by the end of the year. They would be run in several localities where no tramlines existed, and would act as feeders to their general system. If the experiment was a success—and he did not see why it should not be—this feature would be considerably enlarged. Some important changes had taken place in the general management. Their general manager, Mr. Giles, who had managed the Cape Town system, had accepted an appointment in a kindred company. They were much indebted to Mr. Giles for his careful and economical management during a long and trying period of extreme depression. The board were pleased to be able to offer the Cape Town post to Mr. Barkley, the general manager in Port Elizabeth, who had successfully managed that system during the same period of depression, and they were fortunate in being able to select from the staff in Cape Town a capable tramway man in Mr. Freemantle for promotion to the general managership at Port Elizabeth. Both these gentlemen had given proof of their fitness for the posts to which they had been appointed. Last month a circular was forwarded to the shareholders stating that Port Elizabeth had again suffered from a flood, owing to a cloud burst in the valley of the Baakens River. It occurred on September 29th, and was precisely similar in its effect, although in a less degree, to the flood in the same river in December of 1908. Luckily the damage done was much less than that of the previous occasion. So far they had had a rough preliminary estimate, and the total amount of loss would probably not be more than about £1,750, the greater portion of which was covered by insurance. The traffic was only suspended for a few hours, and owing to the energy of the manager and staff the loss of traffic was trifling.

Mr. J. B. Taylor seconded the motion.

Mr. Theophilous asked where the company got its coal from, and also suggested that the board might consider the extension of the tramways from the entrance to the Agricultural Society's premises in Cape Town, down to the main road, a distance of 800 or 1,000 yards. He pointed out that there were a number of houses on the main road, and it also led to the large native location about two miles away. He considered such an extension might lead to a greater use of the tramways by the natives. Having recently visited Port Elizabeth he endorsed the views of the directors concerning the brighter prospects of the company.

The Chairman said the suggestion would be considered, but, of course, it would not pay them to lay down a tramway for the Agricultural Show which was only held once a year. They were using Natal coal, but each year tenders were invited, and they accepted the lowest.

Mr. W. B. Rommel (managing director) said the board had considered the suggestion, but they could not see that it would be a paying proposition. He hoped, however, to make a visit to South Africa next year, and would look into the matter.

Replying to Mr. Joseph, the Chairman said the flood at Port Elizabeth would not cost the company more than about £250.

Mr. Joseph said that with regard to Mr. Theophilous's suggestion, he thought they ought to conserve their money. They did not want to spend money specially for Kaffirs, for a distance of 800 or 1,000 yards was nothing for a Kaffir to walk.

Mr. Theophilous said that if Mr. Joseph was in business in Port Elizabeth he would be glad of the Kaffirs' money.

The report was then adopted, and £800 was voted to the directors for their remuneration.

Companies Struck off the Register.—The following companies have been struck off the Register, and are accordingly dissolved :—

Amalgamated Dry Batteries, Ltd.
Durolite, Ltd.
Edison Gower-Bell Telephone Co., of Europe, Ltd.
Elmore's American and Canadian Patent Copper Depositing Co., Ltd.
Elmore's Foreign and Colonial Patent Copper Depositing Co., Ltd.
Elmore's Patent Copper Depositing Co., Ltd.
Elmore's Wire Manufacturing Co., Ltd.
Premier Boiler Tubes, Ltd.
Rossendale Belting Co., Ltd. (this is the company registered in August, 1902, not that now trading under the same name).
South-Western Electrical Co., Ltd.

Prospectuses.—*The Mexican Light and Power Co., Ltd.*—£1,000,000 of 5 per cent. second mortgage 50-year bonds of this company were offered last week at the price of £87 per cent. The list was closed on Monday.

Toronto Power Co.—The *Times* reports that the issue of 4½ per cent. debenture stock in this company was a great success, applicants only getting 60 per cent. of the amount applied for.

Amazon Telegraph Co., Ltd.—The directors' report for the year ended June 30th, 1911, to be presented at the meeting on November 14th, says that the gross revenue amounts to £118,525, and the working expenses to £54,945. After providing £15,000 for debenture interest and £15,000 for reserve account and deducting the debit balance of £18,493 brought forward from the previous year, the directors now recommend the payment of a dividend of 4 per cent., less income-tax, on the share capital, leaving £5,669 to be carried forward. The duplication of the main cables was fully completed in March last, and since then the communication between Manaos and Para has been satisfactorily maintained. Mr. Eustace C. Quilter, who joined the board in November last year, offers himself for re-election.

Eastern Telegraph Co., Ltd.—The directors' report for the six months ended June 30th, 1911, states that the revenue for the period amounted to £672,397, from which are deducted £232,756 for the ordinary expenses, and £58,603 for expenditure relating to maintenance of cables, sundry differences in exchange, and income-tax payable abroad, leaving a balance of £381,038, to which is added £23,762 brought from the preceding account, making a total available balance of £404,800. After providing for income-tax payable in England, interest on mortgage debenture stock, and for two quarterly dividends on the preference stock, which in all absorb £81,260, there remains a balance of £323.540, out of which the directors have distributed a bonus to the staff in celebration of the Coronation of King George V, costing £24,492, and have placed £150,000 to the general reserve fund, and have allocated £100,000 to meet the two interim dividends of 1½ per cent. each on the ordinary stock, the balance of £49,048 being carried forward. With the view of strengthening telegraphic communication in the Mediterranean, it has been decided to lay an additional cable between Gibraltar and Egypt, touching at Malta.

West India and Panama Telegraph Co., Ltd.—The directors report that for the six months ended June 30th, 1911, the amount to credit of revenue is £47,318, against £43,523 for the corresponding half-year of 1910, and the expenses have been £25,329, against £24,636. The result is, therefore, a balance of £21,989, to which is added £1,584 interest on investments and £1,146 brought forward from last account, making an available total of £24,719. The directors propose that this amount be dealt with as follows:—First preference shares: Dividend, six months to June 30th, 6s. per share, £10,369; second preference shares: dividend, six months to June 30th, 6s. per share, £1,401; ordinary shares: 1s. 6d. per share, free of income-tax, £6,624; reserve account, £3,500; balance to current half-year's account, £2,825. The traffic receipts for the six months show an increase of £3,729 compared with those for the corresponding period.

Western Telegraph Co., Ltd.—The directors' report for the half-year ended June 30th, 1911, states that the revenue for the period amounted to £405,011, and the working expenses to £164,809. After providing £16,373 for debenture stock interest, and £7,930 for income-tax, there remains a balance of £215,898; to this is added the sum of £30,276 brought forward from December 31st last, making a total of £246,175, out of which sum a bonus to the staff to commemorate the coronation of King George V, amounting to £8,613, has been paid. A quarterly interim dividend, amounting to £31,189 has been paid, £140,000 transferred to the general reserve fund, and £10,000 to the land and buildings depreciation fund. The directors now recommend the declaration of a final dividend of 3s. per share, making with the interim dividends a total dividend of 6 per cent. for the year, also the payment of a bonus of 2s. per share, both free of income-tax, which together will amount to £51,982, leaving a balance of £4,390 to be carried forward. The dividend and bonus will be payable on November 16th.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—The directors report for the half-year ended June 30th, 1911, that the gross receipts amounted to £329,709, against £344,960 for the corresponding half-year of 1910. The working expenses, including £18,973 for maintenance of cables, absorb £151,618, against £152,407 for the corresponding period of 1910, leaving a balance of £178,091. From this is deducted £2,942 for income-tax payable in England, £15,048 for interest on debenture stock, and £11,020 for Coronation bonus to staff and other extraordinary expenses, leaving £149,080 as the net profit for the half-year. After adding £27,617 brought forward from the previous half-year, there is an available balance of £176,698. Two quarterly interim dividends of 1½ per cent. each, amounting to £75,000, have been paid for the half-year, leaving a balance of £101,698, of which £50,000 has been transferred to the general reserve fund, and the balance of £51,698 is carried forward.

Stock Exchange Notices.—The Committee has appointed a special settling day as under :—

Wednesday, November 15th.—Water Softeners (France), Ltd.—55,000 shares of £1 each, fully paid (Nos. 1 to 55,000).

And ordered the undermentioned securities to be quoted in the Official List :—

Para Electric Railways and Lighting Co., Ltd.—Further issue of 5,000 6 per cent. cumulative preference shares of £5 each, fully paid (Nos. 129,001 to 134,000).

United River Plate Telephone Co., Ltd.—Further issue of 40,000 ordinary shares of £5 each, £3 paid (Nos. 190,001 to 230,000).

West African Telegraph Co., Ltd.—The directors have declared an interim dividend at the rate of 4 per cent. per annum.

British Electric Traction Co., Ltd.

The adjourned extraordinary general meeting of the shareholders was held at the Cannon Street Hotel, E.C., on Friday, under the chairmanship of Mr. E. Garcke. The object of the meeting was to further consider the directors' scheme for the re-arrangement of the capital of the company. It will be remembered that the first meeting held on October 17th was adjourned to allow a committee representing the ordinary and preference shareholders to confer with the board.

The Chairman explained that the meeting was unanimously adjourned till that date, and the shareholders had in the meantime received a copy of the modified scheme of arrangement. In submitting the amended scheme for the re-arrangement of the capital, he was glad to be able to say that it was unanimously recommended by the directors and by the representative committee of shareholders which the directors invited to confer with them. The amended scheme had also, apparently, met with acceptance by the shareholders generally. It was true some criticisms had been offered by a few shareholders, but these criticisms were of a mutually destructive character. The few preference shareholders who disliked the amended scheme were balanced by the few ordinary shareholders who considered the scheme was not good enough for their class. There was, however, one complaint which had been urged to which he must reply. It had been said that as they gave over two months for the consideration of the directors' scheme, they ought to give longer time than was proposed for the consideration of the amended scheme, but shareholders were under a misapprehension who thought there was any intention to rush the amended scheme through that day. All they could do that day was to lay the scheme on the table and ask them to approve it in principle, and to pass a preliminary resolution to alter the articles of association so as to facilitate the formalities of carrying out the scheme. They would then propose that all the meetings be again adjourned, and even after that there would be a further interval of about three weeks before the confirmatory meetings would be held. The shareholders would, therefore, have ample time for the consideration of the scheme. Moreover, it would be recognised that after all the discussions which had taken place on this question, less time was now required by the general body of shareholders for the understanding of the amended scheme than would be the case if it were put forward as an initial proposal. Then, furthermore, the amended scheme was simpler than the directors' scheme, inasmuch as it did not attempt to accomplish as much as was proposed by the original scheme. At the last meeting he pointed out that the problem which had to be solved was a complicated one, and that the directors' scheme could be simplified only by ignoring some of the factors of the situation The amended scheme did not deal with the capital rights of the two classes of shares in any way, but confined itself to dealing with the question of distributable profits; in that way, the scheme was made simpler. The reason why, at the conference between the directors and the Committee, they came to the conclusion that it was better to refrain from altering the capital rights was this: the ordinary shareholders argued that unless the board could satisfy them by a valuation of the assets that the proposed alteration in the capital rights was fair, the ordinary shareholders were practically taking a leap in the dark in agreeing to give priority of capital to the preference shareholders. Now, the directors had the full conviction that the re-arrangement of the capital, which they had proposed, was fair to both classes; but they had to admit that, inasmuch as they were unable to make a valuation, and, moreover, argued against the advisability of making a valuation, they were unable to offer sufficient evidence to enable others to share their conviction that the assets were of sufficient value to enable the ordinary shareholders to give the proposed priority of capital to the preference shareholders without practically extinguishing their own capital interest in the company. As it was impossible to come to an agreement on this point, it was deemed best to leave the capital position unaltered, and to deal only with the position of the two classes of shareholders in regard to the future distributable profits, and in this respect the amended scheme was easily explained. The preference shareholders received, in exchange for each present £10 share, first, £2 10s. in cumulative preference stock, entitled to 6 per cent. per annum. This represented one-fourth of their existing £10 share with exactly the same rights as at present. Then, secondly, they received £5 in non-cumulative preference stock entitled to 7 per cent. Now here they had two variations from the present position—the £5 stock was non-cumulative instead of cumulative; on the other hand, the new stock was entitled to 7 per cent. instead of 6 per cent. Then, thirdly, the preference shares received £2 10s. in preferred ordinary non-cumulative stock entitled to 6 per cent. per annum, thus making up their present £10, but this last £2 10s. stock ranked *pari passu* with £5 of stock to be given to the ordinary shareholders. The preference shareholders would also receive income certificates in respect of the present arrears of preference dividend amounting to £266,371, or £1 13s. for each £10 preference share. The income certificates were to be redeemed out of profits available for distribution after the payment of the 6 per cent. dividend on the first stock of £2 10s., and of 7 per cent. on the second stock of £5, by the appropriation of an amount equal to the dividend paid in any year on the third or preferred ordinary stock, or, in other words, after the payment of the dividend on the first and second preference stock, the remaining profits were to be divided into two parts, one part of which was to be used to redeem the income certificates, the other part going to the preferred ordinary shareholders up to 6 per cent., and thereafter to the deferred ordinary shareholders. The present £10 ordinary share would in future be represented by £5 in preferred ordinary stock ranking *pari passu* with the £2 10s. preferred ordinary stock issued to the preference shareholders, and the second £5 would be in deferred ordinary stock entitled to all the profits of the company in each year available for dividend after paying the dividends and redemption of income certificates, as already stated. As regarded capital, all shares would rank alike, as at present. It would be seen that the preference shareholders were giving up future cumulative rights in respect of £7 10s., and they were allowing £5 of ordinary share capital to rank equally for dividend with the last £2 10s. of the preference capital, and the dividend on this preferred ordinary stock would come out of profits which at present belonged to the preference shareholders. Expressing the matter in simplest figures, the preference shareholders were at present entitled, out of the profits, when earned, in respect of each £10 share, to a dividend of 12s. per annum cumulatively, and to £1 13s. in respect of arrears of dividend. Under the amended scheme they received 3s. on their £2 10s. first cumulative preference stock and 7s. on their £5 second preference stock, or 10s. per £10 share, before the ordinary shareholders came in for anything, and any surplus profits would, until the arrears were paid off, be distributed in the ratio of about two-thirds to the preference shareholders and one-third to the ordinary shareholders, so that the sacrifice which the preference shareholders made to the ordinary shareholders was not an immediate sacrifice, and was not a serious sacrifice. Now what consideration were the preference shareholders receiving for allowing the ordinary shareholders to receive one-third of the distributable profits after the preference shareholders had had an amount equal to 10s., or 5 per cent. on their present £10 shares? The preference shareholders were receiving a double benefit, the one expressed in figures and the other expressed in the quiet enjoyment of their future dividends. The first benefit was that they got 7 per cent., instead of 6 per cent., on their £5 second stock. It might be said that this was a remote benefit, because it ought not to count until after the preference shareholders had had all the dividends to which they were now entitled, but if that argument was used, then it was a fair retort that the concession which the preference shareholders made to the ordinary shareholders was also remote, though admittedly not to the same extent. The second benefit, which the preference shareholders received had to be stated a little more fully. The ordinary shareholders had made it perfectly clear that, having regard to the existing equal capital rights, it would be to their advantage to have a reduction of capital, so that the amount of preference dividend would be reduced, and if no re-arrangement was made, the ordinary shareholders would, no doubt, take some steps to prevent larger dividends, or, perhaps, any dividends, being paid to the preference shareholders. He was not unmindful of having already stated that the directors were advised that a loss on capital account was not necessarily a loss which had to be made good out of revenue, and that the directors were justified in paying dividends in the face of admitted depreciation of assets, but if they attempted to act strictly on that view, and declined to make any rearrangement so that further arrears of the preference dividend would go on accumulating in front of the ordinary shareholders, it meant that the ordinary shareholders had practically no hope of receiving a dividend, and the preference shareholders must, in that event, be prepared for the ordinary shareholders making some desperate efforts to improve their position in one way or another. Every sensible man of business recognised that a compromise before litigation was generally preferable to a settlement after a prolonged and expensive fight. In thus baldly stating the position to both classes of shareholders, the directors were not taking sides. They had no reason whatever to favour one class of shareholders against the other, but the directors were in a position which enabled them to appreciate the enormous value to the company of a peaceful settlement of the present conflicting conditions. The amended scheme must be considered not by comparison with the first scheme submitted by the directors, but it must be compared with the present position. The first scheme of the directors would have accomplished more if it could have been carried, but it was evident that they could not have carried it except in the teeth of opposition offered by a strong minority. In matters of this kind they could not always have what they would like. There must be some compromise. The directors had recognised this by making necessary amendments in their scheme, and they could only hope that both the preference shareholders and the ordinary shareholders would recognise the wisdom of this principle, and accept the scheme which was recommended to them, not only by the directors with a full sense of their responsibility, but also by a Committee representative of all classes of shareholders, who had by hard negotiation secured for their respective constituents the best terms obtainable. The chairman concluded by moving that the scheme for the rearrangement of the capital of the company be approved in its amended form, and that the board be requested to take steps to alter the articles of association so as to carry the scheme into effect.

Mr. A. Shepherd said that he had been asked to second the motion as one of the representatives of the ordinary shareholders who had been in negotiation with the board. The principal objection they had to the scheme, as propounded by the directors, was that it interfered with the capital rights of the preference and ordinary shareholders, without giving any information as to the position of the company so as to enable them to judge whether the proposed alterations were fair under the circumstances. They did their best to get that information, but the chairman told them, as he told the shareholders at the last meeting, that it was impracticable as well as inadvisable that such a question could be settled by giving them a definite idea of what depreciation had taken place in the assets of the company. Then their position became clear, and they said definitely that unless the directors could give that

information they must oppose to the bitter end any alteration in the capital rights. As the chairman had told them, the board were convinced of the reasonableness of this proposition, and they accordingly receded from the position that the scheme should in any way alter the rights as to capital which the preference and ordinary shareholders had held since the incorporation of the company. Having got so far, it was their duty as reasonable business men to endeavour to frame a scheme which both classes of shareholders could agree to, and that scheme was now before them. Any additional advantages which the ordinary shareholders had given to the preference shareholders was compensated for by the elimination from the scheme of the alteration of capital rights, and he had every confidence in recommending the ordinary shareholders to accept the scheme. The scheme was not exactly what they would have liked, for had it been possible they would have liked the position of the company gone fully into and a reduction in capital made, so that a dividend could have been paid on all the stock. That, however, they had had to forego in deference to the strong views held by the board, but he hoped all the shareholders would join in doing the very best they could and loyally support the board in their endeavour to make the scheme a success. It was no benefit to those who were in the company that there should be dissension and grumbling going on from time to time, and if the scheme were accepted they ought to make up their minds to give it a fair and free chance of success.

Mr. Leopold Solomons, one of the representatives of the dissentient preference shareholders, supported the resolution. He said perhaps in some things they might have done better, but it would have been at the risk of causing dissension in the company. As they knew, a house divided against itself never prospered, and he conceived it better for them to give way a little on the terms he originally proposed as an alternative scheme to that of the board. Having referred to the courtesy with which the board had met them, the speaker said that with regard to giving up the preference on capital, he did not think the company would ever be wound up. It was true that their tramways scattered all over the country were temporarily depreciated, but he believed the day was not far distant when they would all come round again. He was not an expert, but he would give his views as to the value of the securities which they were to get in exchange for their preference shares. The 6 per cent. cumulative preference shares would be worth par. Then they came to the 7 per cent. non-cumulative preference shares, which he believed would come in for some dividend that year, and ultimately he expected they would get the full dividend. He put them down as worth 60 per cent. of their face value. Then there were the preferred ordinary shares which he thought were worth 30 per cent. of their face value, and lastly, there were the arrears of dividend for which they were to get certificates, and those they could not take as being worth less than 10s. Putting these values together they would see that their preference shares were worth to-day nearly £7. If they stuck to them they would one day get par value on all the securities save the arrears of dividend, which would bring them in £11 13s. per share.

Mr. J. B. Braithwaite said that they had heard that the scheme was not ideal, but it was a practical one, and one which had the great advantage of reconciling all the conflicting interests amongst the shareholders, which was of far more value to the company as a whole than any small pecuniary advantage which might be gained by one class of shareholder over another. But, after all, these matters did not affect the earnings, and what they wanted was a new coin of the value of one-tenth of 1s. Last year the company carried 313 million passengers, and the average fare was about 1d. If they had a coin worth 1·2d., or nearly 1¼d., it would make a difference of £271,000 in the company's earnings, the whole of which would be profit.

Capt. Summers proposed an amendment to the effect that the 6 per cent. preference shares should be substituted for 7 per cent. He urged the ordinary shareholders not to vote for a scheme which would place an extra £10,000 a year for all time on the company before the ordinary shareholders got a chance of getting anything.

The amendment was not seconded.

Sir R. Hampson pointed out that there were 7,000 shareholders in the company, and many lived in districts where the company's subsidiary undertakings were in existence. He urged every shareholder to try and forward the interests of the company by taking electric current where possible and by purchasing the productions of the Brush Co.

Mr. Simpson remarked that the preference shareholders were asked to agree to this readjustment, because if they did not the ordinary shareholders would try and get a reduction of capital. But supposing things went wrong, what guarantee had they that in a few years' time the ordinary shareholders would not try and do this? He would like to know how the board had made any safeguard against that.

Mr. Chandler contended that all the gain was on the side of the ordinary shareholders, and it seemed a proper kind of "Lloyd George scheme."

Mr. W. Parker said that obviously no scheme was going to increase the distributable profits of the company a single penny. It simply meant that where there were conflicting interests each side must give and take, and it was all a question whether what was exchanged was fair and reasonable. The company suffered at present from having a fixed charge, which was accumulating against them, and this damaged the credit of the company and its securities. Any scheme which enabled the company to meet these fixed charges must be of benefit to the company as a whole, and therefore the question was whether what the preference shareholders were giving up was balanced by what they were receiving, and the same thing applied also to the ordinary shares. So far as the arrears certificates were concerned, the holders had only to stick to them long enough to get the whole of their cash.

The Chairman said he wished to intervene in the discussion on a matter of order. Engineer-Capt. Pamphlett had written, stating that it was his intention to move a resolution in condemnation of the conduct of the directors. They had explained to him that this being an adjourned extraordinary general meeting, it was not practical to introduce any business other than that left unfinished at the last meeting. But in view of the fact that it was a motion proposing to condemn the directors, the board wished him to say they were most anxious to afford Engineer-Capt. Pamphlett every opportunity to say what he had to say, and if the meeting approved they would stretch a point and allow him to put his motion as an amendment to the resolution. If he was not prepared to do that he would have to rule the motion out of order, because they were bound to carry on the proceedings in strict accordance with the statutes, and it would be entirely out of order to introduce a new matter in his motion.

After a brief discussion on this point, the discussion on the business before the meeting was resumed.

Mr. A. H. Chalmers, who represented the preference shareholders at the meeting with the board, expressed his approval of the scheme.

Mr. Hart asked if the chairman would explain what the ordinary shareholders were giving up. It seemed to him they were getting something and giving nothing up.

Mr. J. H. Alden said he brought his preference shares at £12 10s. as an investment, and he had come there at considerable trouble to protest against the reorganisation. He called it juggling with capital. If there would be a penny more to distribute in dividends, he could understand the use of a scheme, but here the preference shareholders were asked to give up something and the ordinary shareholders nothing.

Mr. Freeman asked what would be the proper occasion on which to ask a few questions as to the way in which the business was conducted by the board.

The Rev. Mr. Atkinson said he did not think the preference shareholders were so much in favour of the scheme as the directors thought they were.

Mr. Cathcart thought it must be admitted that the scheme had been altered in favour of the ordinary shareholders, but, at the same time, the preference shareholders would have the chance of using their proxies against it.

The Chairman said that practically all the questions that had been raised had been answered by different speakers. With regard to Mr. Simpson's question, the scheme was formulated to prevent any such movement as he feared. Mr. Freeman's question was of a personal kind, and he would ask them to allow him to make the position of the directors perfectly plain. Mr. Freeman started by saying that Engineer-Capt. Pamphlett had not had the opportunity of moving his amendment, and therefore what opportunity would he have for asking questions. He wanted to make it perfectly clear that Capt. Pamphlett did have the opportunity of moving his amendment, and it was only after the shareholders had expressed their feeling that they proceeded with the previous question. So far as the directors were concerned they welcomed the discussion, and were sorry Capt. Pamphlett had not been able to tell the shareholders what was on his mind. They had been in correspondence with Capt. Pamphlett for the last seven years, during which he had on several occasions asked the directors to purchase his shares at the price he paid for them.

Capt. Pamphlett: Only on one occasion, please, and it was on counsel's advice.

The Chairman said they had finally to tell him they would discontinue the correspondence, but that if he would cease from imputing bad motives and confining himself to specific questions with regard to the points he wanted information on, the directors would give him that information, and since the beginning of the year his correspondence had been of a much more temperate character. He had asked for a lot of information, and all the questions he had asked had been answered unreservedly. He would tell Mr. Freeman that if any shareholder wanted any information he had only to come to the secretary or ask for an appointment with the directors, and he would get all the information he wanted. All the information had been given to Capt. Pamphlett before, but if he did not want information, but wanted to do something else, he must choose his own opportunity.

Mr. Freeman said he was sorry the chairman took that view, and showed feeling about it. It was not an unreasonable request.

The motion was then put, and carried by 66 votes to 13.

Electrolytic Alkali Co.—The directors' report for the past year shows a profit of only £3,138. The unsatisfactory and unforeseen result is due to several causes, the principal being the serious reduction of output during the summer through the water supply temporarily failing, and reduced prices. But for the abnormal conditions the company would have benefited from the enlargement and improvement of the original processes. The company's capital account has been over-expended to the extent of £32,000; 2½ years dividend is due on the preference shares. The directors cannot recommend payment, and propose issuing £50,000 new preference shares.

Calcutta Electric Supply Corporation, Ltd.—The number of units delivered to consumers during the five weeks ended September 29th, 1911, were 1,292,300, compared with 1,105,049 units in the corresponding five weeks of 1910.

Allgemeine Electrizitäts Gesellschaft.

The report of the directors for 1910-11 first refers to the increase of £1,500,000 in the share capital, and the financial transaction, which was recorded in this journal at the time, with the Felten and Guilleaume Carlswerk Co., whereby the company acquired the latter's dynamo works at Frankfort and also £800,000 in shares of that company. According to programme, the A.E.G.-Lahmeyer Co., of Frankfort, the whole of whose capital is held by the A.E.G., took over the stocks and orders of the dynamo works, which would presumably be cleared off at a profit in the current financial year. The question whether the Frankfort workshops, which were only partly used for manufacturing, should be devoted to other departments, for which otherwise new works would have to be erected in Berlin, was under consideration. As, in any case, an increase and extension of the Berlin shops was urgently required, owing to the larger sales and the extent of existing and prospective orders, six sites had been acquired adjoining the machinery works in Hussiten Strasse and Brunnen Strasse. During the year the prices realised by no means corresponded with the demand, judged from the augmentation in the turnover and amount of orders. In particular the turbine business proceeded without any rule, and over-production would probably occur in the glow-lamp market. The accounts show the following results for 1910-11, the figures for the previous year being added for comparison :—

	1910-11.	1909-10.
Share capital	£6,500,000	£5,000,000
Gross profits	1,257,000	1,055,000
General expenses... ...	38,100	23,900
Taxes	101,000	101,000
Depreciation	34,000	28,000
Net profits	1,085,000	902,000
Reserve fund	156,000	100,000
Bonuses	42,500	37,500
Pension fund	42,500	37,500
Dividend	805,000	700,000
,, per cent. ...	14	14
Carried forward	32,000	21,000

The dividend is at the rate of 14 per cent. on the old capital of £5,000,000 and 7 per cent. on the new capital of £1,500,000. As to the comparatively small amount provided for depreciation, it is stated that the machinery, tools and patterns at all the works have been completely written off, while patents appear at the nominal value of 1s. The gross profits shown have been solely realised from manufacturing and sales, thus indicating that depreciation is largely provided for out of the profits obtained from financial transactions and sales of securities.

The report proceeds to state that the machiney works were so well supplied with orders for all departments that it was not always possible to meet the demands placed upon them. The sizes and weights of electrical machinery were beginning to extend so enormously that the equipment was no longer able to deal with them, and the erection of a machine shop of equivalent extent had to be taken in hand, where heavy main line locomotives would also be built until the completion of the locomotive works. The number of machines and transformers made was 92,186, of 2,385,869 H.P., as compared with 72,460 of 1,476,623 H.P. in 1909-10, the number of small motors having increased by an average of about 30 per cent. in recent years. The new locomotive motors had admirably answered the purpose, and a large number of rack rail electric locomotives had been built for the Japanese State Railway. Apparatus and transformers for pressures up to 110,000 volts and for outputs of over 20,000 H.P. were constructed in the high-pressure factory. In the second half of the year the dynamo works in Frankfort were required to assist the machinery works, and were now carrying out orders for machines and transformers of the F.G.L. type. The shops in the turbine works were well employed, but prices were exceedingly depressed. Steam turbines to the number of 284 of 441,467 H.P. were delivered, as contrasted with 174 of 363,189 H.P. in the previous year.

As the orders for electricity meters and installation material necessitated a rapid extension of the shops, several departments of the apparatus factory were removed to premises rented for the purpose. The employment of the arc lamp shops remained about on the level which obtained in 1909-10; flame carbon lamps of long lighting duration and quartz lamps were successfully introduced. The Oberspree cable factory had a turnover of £700,000 in excess of the previous year, and the consumption of copper rose from 23,000 tons in 1909-10 to 27,000 tons last year. Orders for high-pressure cable again experienced an increase. The insulated wire factory remained fully employed, although at prices which further declined. In the lamp factory the sales of carbon filament types receded by 15 per cent., but those of the miniature lamp rose by 500,000 lamps. The deliveries of metallic-filament lamps increased by 60 per cent. After referring to the company's interests in motor-car companies, the report mentions that business with iron and steel works increased. The advantages of uniform electrification were fully manifested in the new iron works in Lorraine, and the older works would only be able permanently to withstand the competition if they followed the example of the undertakings which had at disposal power stations of 30,000 to 50,000 KW., and supplied motor installations of hundreds of thousands of horse-power. In addition to the central station plant the company furnished one of these works with three driving plants, each of 16,500 H.P., for reversing rolling mills. Two similar driving plants were constructed for Rhenish-Westphalian works, and two others for French iron and steel works.

The electricity works completed represented a capacity of 263,500 H.P., as compared with 226,600 H.P. in 1909-10, whilst the new stations and extensions in progress comprised 492,000 H.P., as against 324,000 H.P. in the preceding year. In the power stations of the Victoria Falls Co. steam turbines of 140,000 H.P. were already in operation, and the first units of the 40,000-H.P. compressed-air plant were running, the remainder to be erected within the next few months. The construction of the Vereeniging Works with an initial output of 36,000 H.P., and having a transmission line 49 miles long, was proceeding. After dealing with the work carried out in connection with overland or cross-country stations, it is stated that numerous orders were received for motor-car equipments for tramways. The most noteworthy event of the year in the electric railway branch was the opening of the trial working on the Dessau-Bitterfeld line on the alternating-current system. The result of the tests had been such that the Prussian State Railway authorities had decided to convert entirely to electic traction two long main lines, namely, between Magdeburg, Leipsig and Halle, a distance of 105 miles, and between Lauban and Konigszelt, a length of 148 miles. It is added that the construction of the Hamburg Elevated and Underground Railway, for which the A.E.G. formed a special operating company in conjunction with friends, had so far proceeded that working on the circle line would presumably be commenced at the end of 1911. The number of employés in the company's service amounts to 60,818, as compared with 41,663 a year ago, and 5,454 of the former are engaged at the works in Vienna, Riga and Milan.

Berlin Electricity Works.

The report of the Berliner Elektrizitatswerke, which have a monopoly in the German capital, states that the improvement in trade and industry in general contributed materially towards the better results realised during 1910-11. The delivery of high-pressure current to large consumers continued to extend, and about 10,000,000 KW.-hours were supplied at the special tariff established for the purpose, the average use of the installations for more than 3,500 hours having confirmed the presumptions upon which the tariff was based. A larger share in the total consumption was expected to be taken by the high-pressure current in the present year. The reduction in the charges for supply for illuminated advertisements, which was rapidly increasing, had also favourably affected the consumption. The interpretation of parts of the contract for the supply of power to the Grand Berlin Tramways Co., referring to the conditions under which reductions in prices were to be granted, had led to differences of opinion between the parties, but a compromise had been arranged whereby the supply company had extended the scale of rebate, whilst the tramway company had undertaken to continue to obtain power from the Berlin Works until 1939, in lieu of 1919, as hitherto provided for under the old agreement. The accounts show the following figures for the two years :—

	1910-11.	1909-10.
Ordinary share capital	£2,205,000	£2,205,000
Preference (4½ per cent.) shares	1,000,000	1,000,000
Obligations	2,873,500	2,398,500
Gross profits	877,000	808,000
Renewal fund	26,900	24,300
Depreciation	222,000	219,000
Municipal share in profits ...	174,000	155,000
Net profits	529,000	486,000
Dividend on ordinary shares ...	264,000	242,000
Dividend on ordinary shares, per cent.	12	11

The dividend of 12 per cent. compares with 11 per cent. in each of the four preceding years, and 10 per cent. in 1905-6. It appears that the number of consumers increased from 28,639 in 1909-10, to 33,165 last year, and the connections reckoned in kilowatts advanced by 23,504 KW. to 206,726 KW., of which 81,260 were for lighting, 112,451 KW. for power, and 13,015 KW. for high-pressure supply. Including consumption at own works, the useful supplies were 51,119,859 KW.-hours for lighting, 72,688,722 for power, 64,405,442 for tramways, and 9,817,720 KW.-hours for high-pressure, being a total of 198,031,743 KW.-hours as contrasted with 174,430,000 KW.-hours in 1909-10. The sale price realised in Berlin, after deducting the tax payable to the city, averaged 15·36 pfennigs per KW.-hour, as against 15·57 pfennigs in the previous year, the decline being attributed to the reductions in prices previously mentioned.

Among the technical alterations in progress the report mentions the substitution in the Schiffbauerdamm station of two direct-current turbo-dynamos for the old reciprocating engines, and a similar change is being made in the station in Mauer Strasse, whilst a steam turbine of 20,000 KW. has been ordered for extensions in connection with the Oberspree station. The extension of the company's scope to Teltow in the South, and Niederbarnim in the North, had been carried out, and high-pressure cables for a working pressure of 30,000 volts had been laid for the purpose. The report also refers to the company's acquisition of one-half of the shares in the Berlin Suburban Electricity Works Co., and the total investments in this and other undertakings are recorded at £1,278,000. It is added that a further increase in the consumption has taken place since the conclusion of the financial year in June.

Cape Electric Tramways, Ltd.—The directors announce a dividend of 2½ per cent.

MARKET QUOTATIONS.

Wednesday, November 8th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a „ Nitric	„	22/-	..
a „ Oxalic	„	28/-	..
a „ Sulphuric	„	5/6	..
a Ammoniac Sal	„	42/-	..
a Ammonia, Muriate (crystal)	per ton	£29	..
a „ „	„	£30	..
a Bleaching powder	„	£5 10	..
a Bisulphide of Carbon	„	£18	..
a Borax	„	£16	..
a Ferro-Silicon (50 %)	„	£11 10	£1 inc.
a Copper Sulphate	„	£20	..
a Lead, Nitrate	„	£24	..
a „ White Sugar	„	£22 15	..
a „ Peroxide	„	£32	..
a Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (75/80 %)	per ton	£20	..
a „ Chlorate	per lb.	3½d.	..
a „ Perchlorate	„	4½d.	..
a Potassium, Cyanide	„	7d.	..
a Shellac	per cwt.	68/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	„	£6 10	..
a „ Recovered	„	£5 10	..
a „ Lump	„	£5 5	..
a Soda, Caustic (white 70 %)	„	£11	..
a „ Chlorate	per lb.	3½d.	..
a „ Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb.	3d.	..
a „ Cyanide (basis 100 %)	„	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£70	..
b „ Wire, in ton lots	„	£102	..
b „ Sheet, in ton lots	„	£120	..
p Babbitt's metal ingots	„	£38 to £145	..
c Brass (rolled metal 2" to 12" basis)	per lb.	7½d.	..
c „ Tube (brazed)	„	9½d.	..
c „ „ (solid drawn)	„	7½d.	..
c „ Wire, basis	„	6½d.	..
c Copper Tubes (brazed)	„	9½d.	½d. inc.
c „ „ (solid drawn)	„	8½d.	½d. inc.
g „ Bars (best selected)	per ton	£72	..
g „ Sheet	„	£72	..
g „ Rod	„	£72	..
e „ (Electrolytic) Bars	„	£58 10	..
e „ „ Sheets	„	£74 10	..
e „ „ Rods	„	£62	..
e „ „ H.C. Wire	per lb.	7¾d.	..
f Ebonite Rod	„	5/8	..
f „ Sheet	„	4/9	..
n German Silver Wire	„	1/11	..
h Gutta-percha, fine	„	5/- to 7/-	..
h India-rubber, Para fine	„	5/4	1/0½ inc.
l Iron Pig (Cleveland warrants)	per ton	46/6½	3½d. inc.
l „ Wire, galv. No. 8, P.O. qual.	„	£14	..
g Lead, English Pig	„	£16 5 to £16 7 6	7/6 inc.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£8 10	..
d Mica (in original cases) small	per lb.	6d. to 2s.	..
d „ „ „ medium	„	2/6 to 4/-	..
d „ „ „ large	„	4/6 to 8/6	..
p Phosphor Bronze, plain castings	„	11d.	..
p „ „ rolled bars & rods	„	1/0½.	..
p „ „ rolled strip & sheet	„	1/1	..
o Platinum	per oz.	185/-	..
e Silicium Bronze Wire	per lb.	8½d.	..
r Steel Magnet, in bars	per ton	£65	..
g Tin, Block (English)	„	£194 to £195	£2 dec.
n „ Wire, Nos. 1 to 16	per lb.	2/2	½d. inc.
p White Anti-friction Metals	per ton	£45 to £150	..
k Zinc, Sh't (Vieille Montagne bnd.)	„	£30 12 6	£1 dec.

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
l Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

STOCKS AND SHARES.

Tuesday Evening.

During the last week a more hesitating mood has overtaken the Stock Exchange, the uncertainty with regard to the labour outlook, accentuated by the inflammatory speeches now being made all over the country, having caused uneasiness in other markets besides that for Home Railways. At the same time, the public still exhibits a disposition to pick up shares in any sound concern offering fair scope for improvement in capital value.

Home Railway stocks have, of course, suffered most from the fear of a general strike, although the falls, big as they are, would have been of much greater extent had not there been a large number of people who refused to be frightened out of their holdings, their argument being that the men are not likely to risk losing the big concessions voluntarily made by the companies. As we pointed out last week, a good deal of the recent buying was on behalf of weak speculators, who immediately rush in to sell on any signs of a reaction, and to these, very largely, the present fall is due.

This depression, however, the Electric Railways have withstood with considerable firmness, and the losses are insignificant in comparison with those registered by most other stocks in the market. Central London Ordinary, in fact, have risen on the week 3 points to 69, while the Deferred at 52 are 1 to the good. Great Northern and City Preferred are also rather better. Metropolitan Consolidated fell 1¼ to 42, and Districts ¾ to 30. Throughout the week support has been forthcoming for these issues (though in the two latter instances of not sufficient size to meet the realisations), owing to the belief that the companies will be enabled to make a profitable bargain with the London General Omnibus Company.

'Bus stock, which at one time went to over 150, reverted to below 140 on revived rumours of the impending formation of a rival company. There is little doubt that some such scheme has been, at least, under consideration; but although it is unlikely that it will come to fruition, it is obvious how useful a lever it places in the hands of the railway companies during the present negotiations.

Underground Electric issues have also met with support. The shares have fully maintained their big rise of last week, while the Income bonds at 66 have put on a further point on top of their jump of £5; the 4½ per cent. bonds at 101 are also 1 better. London United Tramways continue, too, on the up grade, rising another ½ to 3⅞.

Although the modified scheme put forward by the directors of the British Electric Traction Co. has met with the support of the shareholders, the rise in the Preference shares has not been maintained, the price going back ¼ to 4¼. This may be partially due to a natural reaction, but the possibility of a coming reduction of capital has led to selling, although such a scheme would probably be to the ultimate benefit of holders. Dissatisfaction with the terms affected the Ordinary shares, which also fell.

Very little business has been done in English Electricity Supply shares; the continued inquiry for County of London issues has been the one redeeming feature. No quotable change has taken place, but it must be remembered that rises such as these shares have recently enjoyed are invariably the signal for selling by those who got in at lower levels. Rises of ⅛ in Bournemouth and Poole Second Preference and County of London Ordinary to 10⅛ and 12⅛ respectively, and a fall to 10s. in Urban Ordinary, comprise the only changes in this market.

The chief interest of the week has centred on the Canadian-owned concerns, in which there has been great activity. The good progress being made by some of these companies is attracting increased attention. The yields, on the basis of last year's dividends, are, of course, in several cases comparatively small, but the bright prospects are considered by many people fully to warrant the present prices. Montreal Light, Heat and Power was one of the best features with a further rise of 3½ to 183. Sao Paulo Tramways rose three points to 186½, and Shawinigan Water at 122 have put on an equal amount, while the 4½ per cent. Debenture is also better. Mexico Tramways at 124½ have gained 2½ on top of their rise of 3½ last week. Electric Development of Ontario, in which dealings have been particularly brisk, have been in good demand, and at 92½ have risen 1½. Rio Trams reacted ½ to 118½ after their recent rise.

The issue of Mexican Light and Power 5 per cent. Second Mortgage bonds at 87 was well subscribed, and the price is called nominally par at the moment. The common and the cumulative preference have given way, the former as much as three points, owing to sales by those wishing to exchange into the new bonds, apparently with the idea that these are cheaper. The First Mortgage bonds, however, have risen ½ to 96.

Among the other supply issues, Melbourne First Debenture rose ½ to 97½, and Kalgoorlie Preference were ⅛ better at 4⅛. In the railway and tramway list, British Columbia Electric stocks have been well supported, and a general advance is shown, ranging from ½ in the Vancouver Debenture to 2 in the Preferred Ordinary, making the price of the latter 125. The Deferred at 145 gained 1. Brisbane Tramways Investment Ordinary at 7⅞ has scored another advance, and Bombay Second Debenture at 99½ is ½ higher.

In the Telegraph market there have been a good many interesting features, though the tendency is rather irregular. American Telephones have been largely bought, and have moved somewhat in sympathy with American Rails. New York has lately been taking a much more optimistic view of the situation; trade is said to be improving, and the idea is gaining ground in Wall Street that the Government prosecutions of trusts will be likely to abate in vigour now that the vitality of the Sherman Act has been demonstrated. American Telephone capital is 3 higher at 141, and the Collateral Trust rose ½ to 94½. Anglo-American Deferred were rather better at one time, but, on balance, have fallen ½ to 26½, though the Preferred at 111 have gained ½. Small improvements have been scored by Commercial Cable Debenture, Oriental Telephone Debenture and Western Telegraphs, but Reuters gave way ½ to 9½, and Eastern Telegraph ½ to 101½. National Telephone Deferred at 119 have regained the 10s. lost last week. West India and Panama at 2½ have lost 1/16, but the other issues improved, the Second Preference at 10½ showing a rise of 5s.

The Miscellaneous division has been idle, with few changes of importance. Babcock & Wilcox march steadily upward, and have risen ½ further to 5½. The company is understood to be well supplied with orders, and it is now thought that any economies that it will be found possible to make in Naval administration will not affect it. A little liquidation caused a fall of a point to 58½ in British Westinghouse Debenture, and India-Rubber, Gutta-Percha shares gave way an equal amount to 13½. Henley's Debentures rose ½ to 108, while some investment buying of Edison & Swan 4 per cent. Debenture had the effect of raising the price £2 to 69

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations Nov. 7th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bournemouth & Poole, Ord.	* 10	5½	5†	7⅞ — 8⅛	..	6 5 9
Do. 4½ % Pref.	10	4½	4½	8⅝ — 9⅜	..	4 12 4
Do. Second 6 % Pref.	10	6	6	10⅜ — 10⅝	+ ⅛	5 10 4
Do. 4½ % Deb. Stock	Stock	4½	4½	101 —103	..	4 7 5
Brompton & Kensington, Ord.	5	10	9†	7⅝ — 8⅛	..	6 3 1
Do. 7 % Cum. Pref.	5	7	7	7⅞ — 7⅛	..	4 7 6
Central Electric Supply, 4 % Guar. Deb.	100	4	4	99 —102	..	3 18 5
Charing Cross, West End & City	5	5	5†	3½ — 4	..	6 5 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4⅝	..	4 12 4
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅞ — 4⅛	..	5 5 11
Do. Do. 4 % Deb.	100	4	4	94 — 98	..	4 1 8
Chelsea, Ord.	5	5	4†	3⅞ — 4⅛	..	5 14 8
Do. 4½ % Deb.	Stock	4½	4½	98 —100	..	4 10 0
City of London, Ord.	10	7	6†	12¼ — 12⅝	+ ⅛	5 9 10
Do. 6 % Cum. Pref.	10	6	6	11¾ — 12¼	..	4 14 1
Do. 5 % Deb.	Stock	5	5	119 —123	..	4 1 4
Do. 4½ % Second Deb.	100	4½	4½	100 —103	..	4 7 5
County of Durham, 5 % First Mort. Deb.	Stock	5	5	89½ — 91½	..	5 9 8
County of London, Ord.	10	5	4†	6½ — 8⅝	..	5 14 8
Do. 6 % Pref.	10	6	6	11 — 11½	..	5 4 4
Do. 4½ % Deb.	Stock	4½	4½	108 —110	..	4 1 10
Do. 4½ % Second Deb.	Stock	4½	4½	99 —102 xd	..	4 8 8
Edmundson's, Ord.	5	Nil	Nil	⅜ — ⅝	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	2 — 2½	..	Nil
Do. 4½ % First Mort. Deb.	100	4½	4½	82 — 85	..	5 5 11
Folkestone	5	6	6†	4½ — 5	..	6 0 0
Do. 5 % Cum. Pref.	5	5	5	4⅝ — 5⅛	..	4 17 7
Do. 4½ % First Deb.	100	4½	4½	95 — 98	..	4 11 10
Hove	5	9	8†	6½ — 7½	..	6 4 2
Kensington & Knightsbridge, Ord	* 5	1910. 9	1911. 8†	6⅞ — 7½	..	£ s. d. 6 4 2
Do. 4 % Deb.	Stock	4	4	91 — 93	..	4 6 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	80 — 84	..	5 7 2
London Electric, Ord.	3	3	..	1⅝ — 2	..	3 0 0
Do. 6 % Pref.	5	6	6	4½ — 4⅝	..	6 3 1
Do. 4 % First Mort. Deb.	Stock	4	4	89 — 92	..	4 7 0
Metropolitan	5	5	4†	3¾ — 4	..	6 5
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4⅜	..	4 14
Do. 4½ % First Mort. Deb.	Stock	4½	4½	100 —105	..	4 5
Do. 3½ % Mort. Deb.	Stock	3½	3½	84½ — 87½	..	4 0
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	96½ — 98½	..	4 11 5
Newcastle-on-Tyne	5	4	4†	3½ — 4	..	5 0 0
Do. 5 % Pref., Non. Cum.	5	5	5	4 — 4½	..	5 11 1
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	99 —102	..	4 18 0
Notting Hill	10	8	6†	..	..	..
Oxford	5	7½	6+	6½ — 6⅝	..	5 9 5
St. James' and Pall Mall, Ord.	5	10	10†	8 — 8½	..	5 17 8
Do. 7 % Pref.	5	7	7	6¾ — 7¼	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	85 — 87	..	4 0 6
Smithfield Markets, Ord.	5	Nil	..	1⅜ — 1⅝	..	Nil
South London, Ord.	4	5	..	2⅝ — 3	..	6 13 4
Do. 5 % First Mort. Deb.	100	5	5	99 —102	..	4 18 0
South Metropolitan, 7 % Pref.	1	7	7	1⅝ — 1⅞	..	5 17 11
Do. 4½ % First Deb. Stock	100	4½	4½	95 — 98	..	4 11 10
Urban, Ord.	5	5	..	⅜ — ½	— ⅛	..
Do. 5 % Cum. Pref.	5	5	..	2 — 2¼	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	86½ — 88½	..	5 1 8
Westminster, Ord.	5	10	10†	7⅜ — 7½	..	6 7 0
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 5⅛	..	4 3 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5⅛ — 5⅝	..	5 6 8
Calcutta, Ord.	5	8½	..	6⅝ — 7⅛	..	5 19 4
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 10 11
Calgary Power, 1st Mort. Bds.	100	5	5	96¼ — 98¼	..	5 1 6
Canadian Gen. El. Com.	$100	7	7†	107 —110	..	6 7 3
Do. 7 % Pref.	$100	7	7	118 —122	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	3	..	3⅜ — 3⅞	..	3 11 1
Do. 5 % Deb.	100	5	..	93 — 96	..	5 4 2
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	94 — 96	..	6 5 0
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	84½ — 87½	..	5 14 8
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	91½ — 93½	+1½	5 9 8
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/16 — 3/16	..	Nil
Do. 6 % Pref.	1	6	6	5/8 — 3/4	+ 1/16	8 0 0
Kaministiquia Power, 5% G. Bs.	$500	5	5	102 —104	..	4 16 2
Madras, Ord.	5	..	..	2⅝ — 3¼	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	96½ — 98½	+ ½	5 1 6
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	88 — 90	..	5 11 1
Mexican Lt. & Power, Common	$100	4	4†	88½ — 90½	—8	4 8 5
Do. 7 % Cum. Pref.	$100	7	7	106¾ — 108½	— ½	6 9 0
Do. 5 % 1st Mort. Gold Bds.	..	5	5	95½ — 97½	+ ⅛	5 2 7
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	90 — 92	..	5 8 8
Montreal, Lt., H. and Power	$100	7	8	181 —185 xd	+8½	3 15 8
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	..	84 — 86	..	13 17 10
River Plate, Ord.	Stock	10	..	223 —233	+5	4 5 10
Do. 6 % Non-Cum. Pref.	Do.	6	6	106 —112	..	5 7 2
Do. 5 % Deb. Stock	Do.	5	5	101½—103½	..	4 16 7
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	99 —101	..	4 9 1
Shawinigan Water, Capital	$100	4	5†	121 —123	+3	3 5 1
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	..	4 11 9
Do. 4½ % Per. Deb.	Stock	4½	4½	104 —106	+ ½	4 4 11
Toronto Power, 4½ % Deb.	Do.	4½	4½	100 —102	..	4 8 8
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	92 — 94	..	5 6 5
Victoria Falls Power, Pref.	1	Nil	11¼d.	13/16 — 7/8	..	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	106½—108½	..	5 10 7

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	Nil	..	7⅞ — 8½	..	..
Do. 5 % Deb. Red.	Stock	5	5	99 —101	..	4 19 0
American Telep. & Teleg., Cap.	$100	8	8†	140 —142	+3	5 12 8
Do. Collat. Trust	$1000	4	4	93½ — 95½	+ ½	4 3 9
Anglo-American Telegraph	Stock	3¾	3†	67 — 69	..	5 8 8
Do. 6 % Pref.	Do.	6	6	110½—111½	+ ½	5 7 7
Do. Def.	Do.	30/-	..	25/8 — 26/8	— ⅛	5 13 8
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	101 —103	..	4 17 1
Chili Telephone	5	7	..	6⅞ — 7⅛	..	4 18 3
Commercial Cable, Sixty 4% Deb. Stock	Stock	4	4	87 — 89	+ ½	4 9 11
Cuba Telegraph	10	6	6†	10 — 10⅜ xd	..	5 11 7
Do. 10 % Pref.	10	10	10	17 — 18 xd	..	5 11 1
Direct Spanish Telegraph, Ord.	5	4	4†	3½ — 3⅝	..	5 5 8
Do. 10 % Cum. Pref.	5	10	10	8⅜ — 8⅝	..	5 14 3
Do. 4½ % Debs.	50	4½	4½	100 —102	..	4 8 3
Direct United States Cable	10	4½	..	7⅜ — 8⅛	..	5 9 1
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	99½—101½	..	4 8 8
Eastern Telegraph, Ord. Stock	Stock	7	5†	136 —139	..	5 0 9
Do. 3½ % Pref. Stock	Do.	3½	3½	83 — 85	..	4 2 4
Do. 4 % Mort. Deb.	Do.	4	4	100½—102½ xd	— ½	3 18 1
Eastern Extension	10	7	5†	13⅞ — 13⅞	..	5 1 10
Do. 4 % Deb.	Stock	4	4	100½—102½	..	3 18 1
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	98½—100½ xd	..	3 19 7
Globe Telegraph and Trust	10	5⅞	6	10½ — 11	..	5 6 10
Do. 6 % Pref.	10	6	6	12⅞ — 13⅜	..	4 9 9
Great Northern Telegraph	10	18	5†	3 — 3⅜	+ ⅛	5 8 3
Indo-European Telegraph	25	13	5†	56 — 58 xd	..	5 12 1
Mackay Companies Common	$100	5	5†	87 — 90	..	5 11 1
Do. 4 % Cum. Pref.	$100	4	4	73 — 76	..	5 5 3
Marconi's Wireless Telegraph	1	5	..	2 7/16 — 2 9/16	..	..
Monte Video Telephone, Ord.	1	6	6	1⅜ — 1⅝ xd	..	5 12 11
Do. 5 % Pref.	1	5	5	⅞ — 1 xd	..	5 6 8
National Telephone, Pref.	Stock	6	6†	103½—105½	..	5 13 9
Do. Def.	Do.	6	6†	118 —120	+ ½	5 0 0
Do. 6 % Cum. 1st Pref.	10	6	6	9⅝ — 10⅛	..	5 14 3
Do. 6 % Cum. 2nd Pref.	10	6	6	9⅝ — 10⅛	..	5 17 1
Do. 5 % Non-cum. 3rd Pref.	5	5	5	5 1/16 — 5 3/16	..	4 9 11
Do. 3½ % Deb.	Stock	3½	3½	99 —101	..	3 9 4
Do. 4 % Deb.	Do	4	4	99 —101	..	3 19 3
New York Telep., 4½% Gen. Bnds.	100	4½	4½	100 —101 xd	— ½	4 9 1
Oriental Telep. and Elec.	1	8	..	13⅞ — 15½	..	4 16 7
Do. 6 % Cum. Pref.	1	6	6	1⅜ — 1⅝	..	4 11 5
Do. 4 % Red. Deb.	Stock	4	4	88½ — 90½	+ ½	4 8 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	99½—101½	..	3 18 10
Reuter's	8	5	5†	8⅞ — 9⅜	— ⅛	4 5 3
Submarine Cables Trust	Cert.	6	6	130 —133	..	4 10 3
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99 —101	..	4 9 1
United River Plate Telephone	5	8	8	7⅜ — 7½	+ 1/16	5 6 8
Do. 5 % Cum. Pref.	5	5	5	5⅛ — 5⅜	..	4 10 11
West Coast of America	2½	2½	2½	1⅝ — 1⅞	..	4 15 3
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	98½—100½	..	3 19 7
West India and Panama Teleg.	10	1½	..	2⅛ — 2⅜	— 1/16	4 5 1
Do. 6 % Cum. 1st Pref.	10	6	6	10⅜ — 10⅝	+ ⅛	5 11 7
Do. 6 % Cum. 2nd Pref.	10	6	6	10 — 10⅜	+ ⅛	5 14 3
Do. 5 % Debs.	100	5	5	102 —104	+1	4 16 2
Western Telegraph, Ltd.	10	7	6†	13½ — 14	+ ½	5 0 0
Do. 4 % Deb.	Stock	4	4	101 —103	..	3 17 8
Western Union Tel., 4% Bnds. A	$1000	4	4	105½—108½	..	3 13 9
Do. 4½ % Fdg. Bonds	$1000	4½	4½	99 —102	..	4 9 8

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for		Closing Quotations Nov. 7th.	Rise + or Fall —	Present Yield p.c.
	*	1910.	1911.			£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	⅛ — ¼	..	Nil
Do. 5 % Pref.	1	5	5	⅜ — ½	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	80 — 85	..	5 5 11
Brit. Elec. Trac., Ord.	10	Nil	Nil	1⅛ — 1½	— ⅛	Nil
Do. 6 % Pref.	10	1½	1½	4 — 4½	— ¼	3 6 8
Do. 5 % Deb.	100	5	5	98 — 96	..	5 4 2
Do. 4½ % 2nd Deb.	100	4½	4½	79 — 83 xd	+3	5 8 5
Central London Railway, Ord.	100	3	3†	68 — 70	+3	4 5 9
Do. Pref.	100	4	4	84 — 86	..	4 13 0
Do. Def.	100	2	..	51 — 53	+ 1	3 15 6
Do. 4 % Deb.	100	4	4	102 —104	..	3 16 11
City & South London, Ord.	100	1½	1½†	31 — 32	..	4 13 9
Do. 5 % Pref., 1891	100	5	5	108 —110	..	4 11 0
Do. Do. 1896	100	5	5	104 —106	..	4 14 4
Do. Do. 1901	100	5	5	[illegible]	..	4 15 3
Do. Do. 1908	100	5	5	102 —104	..	4 16 2
Do. 4 % Deb.	100	4	4	100 —102 xd	..	3 18 5
Dublin United Trams, 6 % Pref.	10	6	6	11 — 12	..	5 0 0
Great Northern & City, Pr'f. Ord	10	Nil	..	1 — 1⅛	+ ⅛	Nil
Hastings Trams, 6 % Pref.	5	Nil	3†	⅜ — ½	..	Nil
Do. 4½ % Deb.	100	4½	4½	74 — 79	..	5 13 11
Isle of Thanet Trams, 5 % Pref.	5	2½	..	2½ — 3	..	4 3 4
Do. 4 % Deb.	100	4	4	77 — 82	..	4 17 7
Lancashire United, 5 % Deb.	100	5	5	79 — 82	..	6 1 11
London Elec. Railw'ys, 4 % Deb.	100	4	4	96 — 98	..	4 1 8
London United Trams, 5 % Pref.	10	Nil	..	3⅛ — 3⅜	+ ⅛	Nil
Do. 4 % Deb.	100	4	4	71 — 75	..	5 6 8
Metropolitan Railway Consol.	100	1⅜	2†	41⅞ — 42½	—1⅛	3 5 1
Do. Surplus Lands	100	2⅜	3†	65 — 67	..	4 2 1
Do. 3½ % Deb.	100	3½	3½	88 — 90	..	3 17 9
Do. 3½ % Pref.	100	3½	3½	85 — 87	..	4 0 6
Do. 3½ % Con. Pref.	100	3½	3½	84 — 86	..	4 1 5
Metropolitan District Ord.	100	Nil	..	29⅞ — 30¼	— ⅛	Nil
Do. 6 % Deb.	100	6	6	144 —146	..	4 2 2
Do. 4 % Deb.	100	4	4	95 — 97	..	4 3 6
Do. 4 % Prior Lien	100	4	4	99 —101 xd	..	3 19 3
Do. 4½ % First Pref.	100	3½	4½†	86 — 88	+1	3 18 10
Do. 3½ % Gtd.	100	3½	3½	73 — 75	..	4 13 4
Metropolitan Elec. Trams, Ord.	1	5½	5†	3⅞ — 3¾	..	5 12 4
Do. Def.	1	Nil	..	⅞ — 1	..	Nil
Do. 5 % Pref.	1	5	5	⅞ — 1	..	5 0 0
Do. 4½ % Deb.	100	4½	4½	100½ —102½	..	4 7 10
Do. 5 % Deb.	100	5	5	100 —102	..	4 18 0
Potteries, Ord.	1	2	..	⅛ — ¼	+⅛	..
Do. 5 % Pref.	1	5	5	⅜ — ½	..	7 19 4
Do. 4½ % Deb.	100	4½	4½	89 — 92	..	4 17 2
South Metro. Trams, 6 % Pref.	1	6	..	⅝ — ¾	..	6 17 2
Do. 4 % Deb.	100	4	4	72 — 77	..	5 3 11
Underground Elec. Railways	10	..	..	1⅞ — 2⅛	..	..
Do. 4½ % Bonds	100	4½	4½	100 —102	+1	4 8 3
Do. 6 % Income	100	1	1½†	65 — 67	+1	1 9 10
Do. Power House Debs.	100	4	4	100 —102	..	3 18 5
Yorkshire (West Riding), Ord.	5	Nil	..	⅛ — ¼	..	Nil
Do. 6 % Pref.	5	Nil	..	2¼ — 2½	..	Nil
Do. 4½ % Deb.	100	4½	4½	80 — 85	..	5 5 11

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5	5½†	4⅛ — 5⅛	..	4 16 5
Do. 2nd Pref.	5	5	5½†	4⅜ — 4⅝	..	5 2 7
Do. 4 % Deb.	100	4	4	93½ — 95½	..	4 3 9
Do. 4½ % Deb.	100	4½	4½	102 —104	..	4 6 7
Do. 5 % Deb.	100	5	5	100 —102	..	4 18 0
Auckland Trams, 5 % Deb.	100	5	5	103 —106	..	4 14 4
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅜ — 11¼	..	5 6 8
Do. 4½ % Deb.	100	4½	4½	97 — 99	..	4 16 11
Do. 5 % 2nd Deb.	100	5	5	98½ —100½	+ ½	4 19 6
Brisbane Trams Invt., Ord.	5	8	8†	7⅞ — 7⅞ xd	+ ⅛	5 4 11
Do. 5 % Pref.	5	5	5	4¾ — 5¼ xd	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	102 —105	..	4 5 9
B. Columbia Elec. Rly., Def.	100	8	..	143 —147	+1	5 8 10
Do. Pref. Ord.	100	6	6	123 —127	+2	4 14 6
Do. 5 % Pref.	100	5	5	109 —112	+ ½	4 9 3
Do. 4½ % 1st Mort. Deb.	40	4½	4½	99 —102	+1	4 8 8
Do. 4½ % Vancouver Deb.	100	4½	4½	102 —104	+ ½	4 6 7
Do. 4½ % Con. Deb.	100	4½	4½	102 —104	+ ½	4 6 7
Calcutta Trams, Ord.	5	6	..	5⅞ — 6¼	..	4 16 0
Do. 5 % Pref.	5	5	5	4¾ — 5⅛	— ⅛	4 17 7
Do. 4½ % Deb.	100	4½	4½	102 —105	..	4 5 9
Cape Electric Trams	1	Nil	..	⅞ — 1	..	Nil
City Buenos Aires Trams (1904)	5	5	2½†	5⅜ — 5⅞	..	4 5 1
Do. 4 % Deb.	100	5	5	97 —100	..	5 0 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	93 — 98 xd	..	5 2 0
Havana Elec. Rly., 5 % Bonds	$1000	5	5	101½ —104½	..	4 15 8
Kalgoorlie Elec. Trams	1	Nil	..	⅜ — ⅝	..	Nil
Do. 5 % A Deb.	100	5	5	92½ — 96½	..	5 4 9
Do. 6 % B Deb.	100	5	6†	62 — 66	..	7 11 6
La Plata Elec. Trms, Prf.	1	6	6	3⅜ — 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	5½	6†	1 — 1½ xd	..	4 8 0
Do. 6 % Pref.	1	6	6	1 — 1½	..	4 16 0
Do. 5 % Deb.	100	5	5	96 —100	..	5 0 0
Madras Elec. Tr. (1904), Deb.	100	5	5	95 — 98	..	5 2 0
Manaos Trams & Lt., 1st Deb.	100	5	5	90 — 92	..	5 8 8
Manila Elec. R. and Ltg., Bonds	$1000	5	5	98 —100	..	5 0 0
Mexico Trams Com.	$100	7	7†	123½ —125½	+2½	5 11 7
Do. Gen. Con. 5 % Bonds	..	5	5	98½ —100½	..	4 19 6
Do. 6 % Bonds	100	6	6	101 —103	+ ½	5 16 6
Para Elec. Rlys. & Lt., Ord.	5	10	10†	7 — 7⅜	..	6 15 7
Do. 6 % Pref.	5	6	6	5½ — 5⅝	..	5 4 4
Do. 5 % 1st Deb.	100	5	5	99½ —101½	..	4 18 6
Perth (W.A.) Elec. Tr., Ord.	1	2½	..	1⅛ — 1⅜	..	2 7 1
Do. 5 % 1st. Deb.	100	5	5	101½ —103½	..	4 16 7
Rangoon El. Tr. & Sup., Pref.	5	6	6	5½ — 5¾	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	98 —101	..	4 9 1
Rio de Janeiro Trams	$100	4½	5†	118 —119	— ½	3 15 8
Do. 1st Mort. 5 % Bonds	..	5	5	101½ —102½	..	4 17 7
Do. 5 % Mort. Bonds	100	5	5	95½ — 96½	..	5 8 8
Sao Paulo Tram, Lt. and P.	$100	10	10†	184 —189	+3	5 5 10
Do. 5 % 1st Deb.	$500	5	5	104½ —106½	..	4 18 11
Singapore Trams, 5 % Deb.	100	5	5	82 — 85	..	5 17 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	95½ — 97½	..	5 2 7
Un. Elec. Trams Monte Video	5	6	7	5½ — 6	..	5 0 0
Do. 6 % Pref.	5	6	6	5 — 5½	..	5 9 1
Do. 5 % 1st Deb.	100	5	5	99 —102 xd	..	4 18 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	106 —108	..	4 3 4

MANUFACTURING COMPANIES.

Aron, Ord.	1	Nil	6	⅜ — ½	..	Nil
Do. 6 % Pref.	1	9	6	⅝ — ¾	+ ⅛	7 2 2
Babcock & Wilcox	1	26	24†	5⅜ — 5⅝	+ ⅛	4 6 8
Do. Pref.	1	6	6	1⅝ — 1¾	..	4 0 0
B.I. & Helsby Cables	5	10	8†	6⅞ — 7⅛	..	6 17 11
Do. Pref.	5	6	6	5¾ — 6¼	..	4 16 0
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	94 — 97	..	4 12 9
British Westinghouse, Pref.	3	Nil	..	¼ — ½	..	Nil
Do. Deb.	100	4	4	57 — 60	—1	6 13 4
Do. 6 % Prior Lien	100	6	6	100 —102	..	5 17 8
Browett, Lindley, Ord.	1	Nil	..	1/6—2/-	..	Nil
Do. Pref.	1	Nil	..	5/- —6/-	..	Nil
Brush, Ord.	3	Nil	..	⅛ — ¼	..	Nil
Do. 7 % Pref.	2	Nil	..	⅝ — ¾	..	Nil
Do. 4½ % Deb.	100	4½	4½	56 — 61	..	7 7 7
Do. 4½ % Second Deb.	100	4½	4½	39 — 44	..	10 4 6
Callender's Cable	5	15	10†	9 — 9⅜ xd	..	7 13 10
Do. Pref.	5	5	5	4⅛ — 5⅛	..	4 16 5
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
Castner-Kellner	1	17½	7½†	8⅞ — 9⅛	..	4 18 3
Do. Deb.	100	4½	4½	104 —108	..	4 3 4
Crompton & Co.	3	Nil	Nil	⅝ — ¾	..	Nil
Do. Deb.	100	5	5	65 — 65	..	7 13 10
Dick, Kerr	1	5	..	⅝ — ¾	..	5 14 3
Do. Pref.	1	6	6	1⅛ — 1⅜	..	5 12 11
Do. Deb.	100	4½	4½	95 — 98	..	4 11 10
Edison & Swan, A, £8 paid	5	Nil	..	⅜ — ½	..	Nil
Do. fully paid	5	Nil	..	1¾ — 2¼	..	Nil
Do. 4 % Deb.	100	4	4	69 — 73	+2	5 9 7
Do. 5 % Second Deb.	100	5	5	77 — 80	..	6 5 0
Electric Construction	2	Nil	2½†	⅝ — ¾	..	6 13 4
Do. Pref.	2	7	7	1½ — 1⅝	..	7 4 4
Greenwood & Batley, Pref.	10	7	7	7½ — 8¼	..	8 5 8
Do. Deb.	100	5	5	94 — 96	..	5 4 2
General Electric, Pref.	10	5	5	9 — 9½	..	5 5 3
Do. Deb.	100	4	4	86 — 91	..	4 7 11
Henley's, Ord.	5	15	10†	11½ — 12⅝	..	5 18 10
Do. Pref.	5	4½	4½	4⅛ — 5⅛	..	4 5 11
Do. Deb.	100	4½	4½	107 —109	+ ½	4 2 7
India-Rubber, G. & T.	10	10	..	13½ — 14½	— ½	6 17 11
Do. Pref.	10	5	5	9½ — 10½	..	4 16 5
Telegraph Construction	12	20	10†	36¼ — 38½	+ ½	6 2 1
Do. Deb.	100	4	4	100 —102	..	3 18 8
Willans & Robinson	1	Nil	..	⅜ — ½	..	Nil
Do. Pref.	1	Nil	..	⅜ — ½	..	Nil
Do. Deb.	100	4	4	55 — 60	..	6 3 1

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

The yields are in all cases calculated upon the dividends paid for 1910.

Bank rate of Discount 4 per cent., September 21st, 1911.

THE ELECTRIC VEHICLE IN AMERICA AS A PROFITABLE OFF-PEAK LOAD.

[FROM AN AMERICAN CORRESPONDENT.]

THE primary function of the commercial head of a central station company is to connect new load to the company's mains. At one time this was considered to be his only function, irrespective of whether such load were itself profitable, or whether it were likely to lead to the absorption of further profitable load. Probably all load is worth having; but at the present stage of the development of the central station idea, a great deal of well-directed energy is required in order that a sufficiency of profitable load may be obtained. By profitable load I mean, of course, "off-peak" load, *i.e.*, a load which can be carried during the valley of the load curve at practically negligible cost, and with naturally a beneficial effect on the daily load factor of the system. This is another way of saying that the secondary function of the commercial man, and not of far inferior importance to his primary function, is to do all he can to improve his station's load factor.

Battery-charging as a Profitable Off-peak Load.—Five years ago the possibility that the electric vehicle might furnish a profitable central-station load was not seriously considered. In the first place, the vehicle had not sufficiently proved its worth as a commercial success to warrant the supposition that the next few years would see any considerable advance in its popularity; but even if it had, there were few men who would have predicted its further introduction on such a scale that battery-charging might really run to many kilowatt-hours per day, and that great possibilities were therefore open in the way of obtaining a profitable off-peak load.

Now I am a little out of touch with English affairs, and I do not know exactly to what extent the central station companies in English cities have realised these possibilities. But there is no doubt that in the United States the power station people have fully awakened to a realisation of the opportunity, and it may be interesting to record some of the signs of this awakening.

In introducing my topic in this manner, I trust I have made it evident that I am not endeavouring to hold up the American central station man before the British, to the lauding of the former and the disparagement of the latter. The limiting conditions under which each must conduct his business have many points of difference. Any comparisons which could be made could not be based upon grounds of any similarity in each case, and no comparisons are therefore attempted. A knowledge of what the American supply man is doing to get this off-peak load, however, may be of service to the Britisher by way of suggestion, since, while some of the commercial moves of the former will obviously not be applicable to English conditions, others may, with but slight modification, be made to serve their turn among the more conservative and less susceptible English commercial folk.

In this country there is a healthy spirit of competition between many of the large cities, and again between many of the smaller cities in the same State, with regard to electrical development, evidencing itself in the street lighting systems, in the urban traction systems, industrial power applications, and so forth. The electric vehicle question is no exception, and the city of all others which has decided to get right ahead with the fostering of the electric vehicle business is the city of Boston. Other cities, and especially those in the New England States, have made novel departures in various directions to popularise the electric vehicle, but for good collective all-round work, Boston can show the worthiest record, and it is inevitable that I mention the name of this city frequently in writing these notes.

Ignorance and Prejudice are the Principal Obstacles.—Let us for the present leave on one side all consideration of the pleasure car, and confine our attention to the commercial vehicle, the light car for a grocery or dry-goods store, the freight handling truck for a railway company, the ice delivery or coal delivery wagon. The parties interested in the sale and operation of such wagons are the makers of the vehicle, the makers of the electrical equipment including motors and battery, the electric supply company, and the proprietors of the garage who are going to house and charge the vehicle. The last class may not be in existence, but they have got to exist before the proposition can be a practical one in any given city. All the parties will benefit through the introduction of the electric vehicle in the city. What is the principal objection which is standing in the way of their realising these benefits?

The principal obstacle, in many cases the only obstacle which they have to overcome, is simply ignorance on the part of the business men of the possibilities of the electric vehicle. If the electric vehicle were inherently still an unsatisfactory machine, it would be idle for the central station people to expect that they could do any good with it. But it suffers to a certain extent from its earlier disadvantages, which succeeded in many cases in getting it a fairly bad name; and the prejudice against it, or the total ignorance of what it can now accomplish, must be overcome. Listen to this. A big brewery company in New York, dissatisfied with the performance of an electric truck which they had purchased years ago, vowed that they would stick to horses and gasolene. After a long canvass, they yielded to argument, and accepted a new electric on trial, promising that if it gave satisfaction they would purchase a further consignment in a few months. At the end of the specified time, the order for the new (5 ton) trucks duly came in, with a further promise that if this second batch came up to the first one in quality and performance, they would bring their total up to 12. In quite a little time all the 12 were in service, the reason simply being that the brewery company (whose actual annual turnover I do not know) figured that they were saving $20,000 a year in transportation. There is an abundance of facts and figures which I could submit to prove the worth of the electric, but that is not within the scope of this article.

With individual disjointed effort, this prejudice and ignorance will be overcome in a few years, but with concerted effort and a sufficiency of enterprise, it can be overcome in six months or a year. I am only considering now the effect on the central station. How, and to what extent, does the central station benefit from the battery-charging load as regards the load factor of its system?

Actual Energy Consumption of Commercial Vehicles.—Roughly, 90 per cent. of all battery charging may be arranged to take place on off-peak hours. Under these conditions, we may assume that the central station is willing to allow 2d. for a KW.-hour. Now, the following table gives the total annual consumption in KW.-hours of energy for battery charging, based upon a demand 20 per cent. less than the maximum capacity of the battery. These figures I have seen in various papers and articles on the subject, but I believe that acknowledgment for their use is justly due to the General Vehicle Co., of America.

Type of vehicle.	Estimated KW.-hours. Average annual demand.	Income at 2d. per KW.-hr.
5-ton truck	11,000	£91 13 0
3½-ton truck	9,360	78 0 0
2 " "	7,440	62 0 0
2,000-lb. wagon	5,520	46 0 0
1,000-lb. "	4,560	38 0 0
Domestic vehicle	2,400	20 0 0

The above figures give some idea of the income which these vehicles will yield. Taking a concrete case, suppose that in a city of 100,000 population, the supply company, through well-directed effort, were to succeed in persuading 100 merchants of the town to use one electric vehicle each for their delivery service, and that each of these vehicles consumed, say, 6,000 KW.-hours per annum, then the annual income from battery charging would be in the neighbourhood of £5,000. Actually the income would not stop at this figure, as if the 100 vehicle mark were reached, there would be a steady increase in the number of vehicles ordered; no man would be content with one electric if this still left him with some horse traction on his hands, and repeat orders would come in rapidly. The figures are based on 2d. per KW.-hour, which is surely reasonable.

The value of the battery-charging load can perhaps best

be appreciated by comparing the KW.-hours with the equivalent energy consumption of arc lamps, glow lamps, domestic appliances, &c. The vehicle is in service all the year round, summer and winter, week in and week out. If it is in service all day, then it has got to be charged at night, and this, therefore, nearly always takes place after 8 o'clock in the evening. The establishment expenses for billing, accounting, metering and other charges are all very low relatively, for a customer using even one vehicle only, while, as a matter of fact, very few customers use only one, and the advantages in this direction are, therefore, pronounced.

According to some figures published in the *Electrical World* (May 4th, 1911) there were in 1907 some 18 electric automobiles in the city of St. Louis. At the present time, as the result of the efforts of the supply company in advertising, and in the establishment of garage facilities, there are upwards of 500 electric vehicles in that city, "the average income from which is $8.50 per month in the case of cars stabled in public garages"—which extract plainly shows what is possible in the development of this business. Or, again, in the case of Springfield, Mass., little over a year ago there were fewer than half-a-dozen electric vehicles in the town. A campaign was set on foot to alter this state of affairs, undertaken purely by the electric supply people, and to-day there are upwards of 50 electric cars or electric trucks in that city, with a population of a little over 50,000.

How American Supply Companies proceed to Secure this Off-peak Business.—Now we will consider how these results can be achieved; how they have been achieved. The first thing is to get the vehicle known. When, in the early part of this year, Boston decided to get down to the problem, it was realised that the Edison Co.—the power supply company—would gain by working hand-in-hand with the makers of the vehicle. An extensive newspaper advertising campaign was inaugurated; a capable staff of salesmen was organised to make a thorough canvass of the merchant houses of the city; special attention was paid to the erection and equipment of a number of garages, with special charging facilities and charging rates; and a "sign advertising" campaign on a large scale was taken in hand. This last expedient may not be applicable to English cities, but it is an interesting example of American advertising methods. The supply company undertook to supply electricity free of charge to dealers in electric vehicles for the purpose of sign illumination for advertising the vehicle; and, furthermore, undertook to provide also free illumination of a large sign in a conspicuous part of the city which should make a display advertisement of all the local electric vehicle dealers and agencies. The point is that they realised that every effort on their part which could help the vehicle people to sell their product in their city could only react to their own advantage; so they decided to leave no stone unturned in order to further the vehicle sales by any advertising means in their power.

The electric vehicle people, for their part, were not slow to respond, and entered thoroughly into the mutual advertising spirit. One enterprising firm even offered to sell 100 vehicles at factory cost to any electric supply concern in the New England field, in order to assist in the development of the electric vehicle business in that area. The Electric Vehicle Club, of Boston, is the official body watching over the interests of the vehicle business in that city, and at the weekly meetings of the club a thorough discussion is made of the various ways and means whereby the interests of the business may be advanced. The value of such a body is obvious. Some of the difficulties which are encountered in the development of the business can best be met by some such parent body, such as difficulties with the city authorities. Local bye-laws may prevent a vehicle waiting idle at the kerb for more than a certain time, but it has not been difficult to arrange advantageous terms with regard to parking facilities, and a modification of the bye-laws has been agreed to where this has seemed necessary.

Boston was not the only place where the supply companies "got busy" over the newspaper advertising. Springfield relied chiefly upon this form of publicity in bringing its total of electrics from six to over 50 in the course of 12 months. The electric supply companies took page and half-page spaces in the daily and weekly papers of the town, and devoted the space simply to setting forth the advantages of the electric vehicle, specifying no particular makes, but dealing only with the vehicle in general. This is a good example of educational advertising, and its results, as we have seen, fully justified the expenditure. It was a gamble, in a sense, but it succeeded.

The Public Garage System.—Undoubtedly the question of suitable garage accommodation is a serious one, and, indeed, may almost be said to be the key to the situation. When once a merchant has been induced to invest in a single vehicle, it is essential that it should prove a success in all respects, since the investor will inevitably regard it somewhat in the light of an experiment and will be on the lookout for faults. The battery is the vulnerable part of an electric vehicle—that is to say, it is the vulnerable part, if the machine is not treated with due respect. In many cities, the public garage system has not been carried very far, this remark applying more to those places in which most of the electric vehicle business is taken by pleasure cars. The owners of these vehicles will usually take sufficient care of them to preserve the efficiency and life of the battery; but where the commercial vehicle is in question, the unskilled attendance which it receives nearly always results in deterioration of the battery, and the public garage system is almost imperative. There are many cities, too numerous to mention, but of which St. Louis, Boston, Cleveland and Minneapolis are good examples, where excellent garages have been erected and equipped, for the accommodation, maintenance and charging of a number of cars varying from 20 up to a hundred and more, the larger the better. The cost per vehicle of the "sub-station" equipment, rectifier outfits, &c., is, of course, reduced in proportion as the number of cars cared for is increased, although it is, of course, necessary to avoid the tendency to make the garages too few and far apart as not to be within easy reach of any point within the business area. At these institutions, in cities such as those I have named, it is usual to charge a flat rate of $25 or $35 a month for storage, maintenance, delivery, charging and small repairs. The advantages of the system are obvious. Only skilled men are employed, who have been carefully instructed in their business, and the repair item is reduced to a minimum on the "stitch-in-time" principle. Any progressive fault in a battery can be quickly noted and remedied, whereas if a similar case occurred in a private garage installation, no notice would be taken of it until it had reached such a point as possibly to cause delay on the road, whence complaints would inevitably arise. One of the large garages of the Boston Edison Co. has been placed under the direct supervision of the Electric Vehicle Association of America, and the tendency towards skilled supervision and inspection will, therefore, in this case be further emphasised.

In certain cases it may be found advisable to adopt the private garage system, and if in endeavouring to close a contract the central station canvasser imagines that the prospective customer would not be averse to making a trial of the electric vehicle under his own supervision, the canvasser should be ready to meet him. Boston, again, has a move ready to meet this emergency. The Edison Co. there have made arrangements to supply and install a rectifier charging outfit free—or, rather, at a nominal charge of $5 a month—to anyone desiring to try the electric vehicle, confident that the result can only go one way. If anyone prefers the private charging system, it may be usually taken to mean that due steps will be taken on his part to see that the vehicle and all the auxiliary equipment will receive careful handling and attention.

The Use of the Electric Vehicle by the Supply Companies.—The New York Edison Co. have also gone well ahead in the electric vehicle campaign, and themselves now own close on 100 commercial trucks and wagons of one kind or another. It is obvious that the electric supply company can do very useful advertising work in this manner, simply by using the vehicles themselves in their own transportation work, apart altogether from the actual advantages they obtain in quick and reliable transit. These 100 wagons are used for a variety of purposes—for dispatching crews on breakdown jobs, transferring tools, apparatus and material, and carrying meters—this being made ideally satisfactory by the design of a special body to the truck, fitted with receptacles around the walls for the bestowal of meters, in a manner similar to

the baker's cart for carrying loaves of bread, the meters being guarded against knocks and jolting in transit.

The New York Edison Co. have also several heavy trucks fitted with a winch for pulling cables through underground conduit in the streets. In some cities a special electric car is built with an upright pole and rigging affixed to the back of the body, which may be used as a derrick for swinging street poles, lamp-posts, &c., into position. Boston has several trucks provided with a rotary pump for draining manholes; and, in fact, there is hardly an end to the list of uses to which the electric car can be put, entirely outside the field of delivery and freight transportation.

In the summer of 1909 there were only some 10 electric supply companies using the vehicle for their own work; but by September, 1910, the figure had reached 36, and at the present time this total again has probably been well exceeded.

When the supply company is undertaking this work of advertising the truck by using it itself, great pains are taken to see that the advertisement *is* actually a good one. This applies particularly in the case of the first electric truck put on the streets of the city. No faults must show here; the wagon must be smartly turned out, and a breakdown must be a thing undreamed of.

The Necessity for a Staff of Special Canvassers.—Another matter to which I have already alluded in recounting the various steps in the Boston programme, is concerned with the salesmen staff of the supply company. All the usual attributes of the engineer salesman are required, and a good deal more besides. The canvasser must be ready to make definite recommendation as to the size of truck which the customer requires, and must be well posted as to the geography of the place, knowing well the condition of the streets, the number of steep gradients and other local street lore.

It were easy to multiply instances showing what has been done by the electric supply corporations in various American cities to popularise the electric vehicle, but the foregoing will probably suffice. In nearly all cases the campaign has required considerable courage on the part of the supply men, since it is in the nature of a gamble, to determine whether the merchants will respond; but in no single case where the publicity programme has been conducted by clear-sighted men, in touch with local affairs and requirements, has the result been in any doubt. Maybe some of these methods would be applicable to English conditions. There is no doubt about the value of the charging load if only the vehicles can be got on the road.

REVIEWS.

The Testing of Engines, Boilers and Auxiliary Machinery. By W. W. F. Pullen. Manchester: The Scientific Publishing Co. Price 12s. 6d.

This is the second edition of a book which was first named "Experimental Engineering." Apparently the volume has been greatly enlarged and almost rewritten. It is about ten years since it first appeared, and during the past decade there has been much progress in scientific engineering work. Moreover, it has now become most fully recognised in our educational institutions that experimental work is a very useful method of teaching. It is, we imagine, almost entirely for the student, and not so much for the engineer in practice, that the book has been written; doubtless many people outside of colleges, besides the lucky manufacturers whose apparatus is described, will find that the contents contain something of interest to them. Although there are 721 pages and 733 illustrations, the book is portable. The publishers seem to have done their part in a satisfactory manner. If, at moments, we are disappointed with what the author has produced, it is largely because we expected great things from a man with such experience in teaching, writing and the experimental side of engineering. To be outspoken, there are portions of this volume quite unworthy of him. While we can at once say that a number of students, and engineers, will find the book worth the money, yet we certainly think it could be greatly improved. For example, in the year 1911 we might reasonably expect more mention of the steam turbine, and although the words appear in the text we have certainly failed to discover them in the index. There are, it is true, some 10 pages on torsion meters (fig. 211 in this section has a title with the word "tension," a misprint for torsion), and it is equally true that a good deal of the general arrangements for steam engine testing are said to be applicable to steam turbines, but we think more might have been added with advantage. There is also so much that could with advantage be left out, that the book might well be reduced in price.

There is a four-page introduction on testing, containing sound common sense. Then comes the first chapter, which consists of tables and other data. We note that Regnault's steam tables are given, despite the more recent work, especially that of Callendar. Reference is made to this research in the text, a few equations from Callendar's paper being included. There is a misstatement, as n R/T is not = specific heat at constant volume at *freezing point*, but at *no pressure*. Then we have the following advice: "The easiest way of dealing with the above equation is to obtain the required results in metric units and then transform to English units." Surely it would have been more convenient to the reader if the author had modified the constants so as to make the equations applicable to English units. It should be stated that Regnault's tables have been corrected for the most recent values of the absolute zero of temperature (− 459·6° F), and the mechanical equivalent of heat (778 ft.-lb.); also curves show the results of more recent research work by some experimenters on the properties of steam. A short chapter on averages leads us on to the measurement of pressure. Here the illustrations are very much of the catalogue variety. A line diagram in place of figs. 29 or 30 would have been much better. In the next chapter (on the measurement of temperature) we find some of the latest work and apparatus described. The measurement of speed has a chapter descriptive of revolution counters, tachometers, &c. The measurement of power output is then discussed, all sorts of brakes being shown. Among the simplest is the Morris & Lister eddy-current brake. Dynamometers used in traction work are shown, although a separate chapter is devoted to the subject of measurement of power input with the dynamometer.

It is, however, from page 252 up to page 413 that the author really thoroughly enjoys himself. These pages are all about indicators and their diagrams. Although Mr. Pullen has written a separate book on the subject, he cannot deny himself the delight of elaborating, in great detail, the difficulties of obtaining accurate diagrams and of interpreting what they mean. When you are a specialist upon one particular subject, you cannot view the matter in its correct perspective when you are writing a general text-book. Here too much space, in proportion to the subject, is taken up with indicators and semi-catalogue pictures. Thus, fig. 225 shows the Thompson indicator, one-half natural size. Fig. 226 shows it *in* the box, and fig. 227 shows it attached *to* the box. There is a section about the Thompson indicator in general, then one on the large Thompson, another on the 1900 pattern Thompson, yet another one on the small Thompson, with a further one on the outside spring Thompson; one gets tired of the Thompson family and their portraits, five in number. Then we have every variety of the Crosby indicator. Since all the steam engine indicators are on the same principle and vary only in detail—chiefly the pencil mechanism—why all the many photographs are included is difficult to understand. When we come to the chapters on indicator diagrams, we find that a good deal of the descriptive matter could well be concentrated. (It is only fair to say that the collection of diagrams showing the various faults, &c., is very complete.) Probably the best type of illustration is that on gas engine diagrams (figs. 504, 505), where 10 diagrams are made to cover about three-fourths of a page. This arrangement should be contrasted with fig. 470, where much space is wasted.

There are useful hints on testing engines and the calorific value of fuels. The chapters on flue gas analysis and boiler testing are not so good. As an example, take the section devoted to the Orsat apparatus. The picture on page 577

is freely lettered. A great many references to these letters are made on the next two pages, which means that one has to be continually turning back to the figure. The description could be made in a much less laboured manner. As for the Sarco automatic CO_2 recorder, the picture in that case has different portions numbered, and when the reader sees that there are *100* such numbers, he begins to wonder if it isn't a memory lesson. Take this as a sample sentence: "Thence it passes into vessels 77, 66, 67 and 68 and into tubes 51, 52, 48 and 49." That is just the sort of fashion in which some makers are foolish enough to compile their catalogues. Can one wonder that the always overworked engineer gives the thing up in despair? In the chapter on boiler trials we have not only the recommendations of the Institution of Civil Engineers, but eight pages on which are reprinted the recommendations of the American Society of Mechanical Engineers. The chapter on testing auxiliary machinery is excellent, and so is the last one, on testing internal combustion engines. In one of the Appendices (p. 713) there is a clear diagram of the θ φ chart.

Although we have pointed out what we consider are the blemishes in the book, it contains a great deal of excellent matter. It is a monument to the author's industry. What is really required now is that some hard-hearted individual should take hold of it and unmercifully cut out all that is superfluous. The publishers should send it to some capable experimenter, who also knows how to write a book for the student, with instructions to reduce it to one-half the size. In a word, the editor's blue pencil is needed. Even as it is, the book can be recommended to men with money to spare. If all power-plant engineers studied it carefully, some of them would save on their coal bills. We cannot enthusiastically advise the student to purchase it, though it is essentially a supplementary book for the student.

Building in London: A Treatise on the Law and Practice Affecting the Erection and Maintenance of Buildings in the Metropolis. By Horace Cubitt, A.R.I.B.A., P.A.S.I.; with special chapters dealing with "The Cost of Building Work in and Around London," by H. J. Leaning, F.S.I., and "The Valuation, Development, and Rating of London Property," by Sydney A. Smith, F.S.I. London: Constable & Co. Price 31s. 6d. net.

It sometimes falls to the lot of a reviewer (who need not, of necessity, be an Irishman) to criticise those portions of a book which are conspicuous by their absence. Laying down a standard for himself, he can run on in such a vein to his heart's content, carefully avoiding the laborious process of checking and verifying the statements to which the author has actually committed himself.

It is difficult to imagine how any reviewer could so treat the work now before us. It is practically encyclopædic in character. Not only does it cater for the needs of the builder, who is called upon to steer his way through the mass of legislation which goes to make up the building laws of the metropolis, but the lawyer will find a vast amount of information of the severely practical type which is not often to be found in the volumes on his bookshelf.

In dealing with his subject the method adopted by the author is that of taking the various practical questions of street formation, drainage, air space, construction, &c., and treating of each of these in a separate chapter, where an attempt is made to include and explain the whole of the requirements of the law. In order to satisfy the scruples of those who do not care to trust to a mere quotation, all the provisions of the Acts, by-laws, and regulations which have reference to building work in London are printed in the second part of the volume. As the author admits in his preface: "Sometimes all that can be said is that the law is in an uncertain state, and that the obtaining of legal opinion is advised if interests of importance are involved."

Unless the present writer were the happy possessor of an encyclopædic mind, it would be impossible for him to give a complete and trustworthy review of this volume. A work which deals with everything from the erection of steel frame buildings and aeroplane sheds (giving the estimated cost of the latter) to the development of building sites from the financial point of view, would require to be dealt with by a jury of experts. Other technical journals will probably deal with those parts of the work which concern them. A few words may here be said upon those portions of the author's work which more especially concern the electrical world.

In dealing with the London Building Act in its relation to electricity buildings, the author draws attention to the fact that while such buildings are exempt from the general operation of the Act, they are subject to special treatment, the plans having to be submitted to the County Council for approval. He points out that if this provision was intended to allow greater freedom of construction, it has not operated satisfactorily, and then says: "It seems practically certain that if the routine in the case of such buildings were similar to that in the case of public buildings—the approval of the construction by the district surveyor, subject to there being a right of appeal to the tribunal—a great deal of unnecessary trouble and delay would be avoided."

Amongst other electrical matters which are dealt with are to be found the regulations as to the erection of generating plant, batteries, transformers, motors, &c., in places of public resort.

An elaborate system of cross references, and an exhaustive index, in which a table of cases is interspersed, tends to render this work most useful to the many classes of the professional community for which it is intended.

A Hand-Book on the Gas Engine. By H. Haeder. (Translated from the German and Edited by W. M. Huskisson.) London: Crosby Lockwood & Son. 18s. net.

After the title of this book we read, "Comprising a practical treatise on internal-combustion engines for the use of engine-builders, engineers, mechanical draughtsmen, engineering students, users of internal-combustion engines, and others." (The last word is delightfully vague.) However, it is only fair to say that the "Hand-Book" is really for the designer and student. It is, from their point of view, good, for it is an aid to the design of internal-combustion engines. It is a book for the drawing office, and not the works or the "others." There is no other book that can compare with it for the purpose mentioned. It will soon be really indispensable to the designer (student or draughtsman), and the information in all of the chapters and in the appendices is good. We are sorry that Mr. Huskisson "spoilt the ship for a ha'porth of tar" by reprinting Mr. Humphrey's paper (excellent as it is) on his own pump. It means a great deal of work to put a description of a new invention in concise terms, but, after all, Mr. Humphrey has issued a considerable quantity of literature about his pump, and one might reasonably expect something better than a reprint in a book of this character. The translator should have reduced the description of the Humphrey pump to about a page, and omitted all of the superfluous tables.

The book is typically German; it represents prodigious industry and little originality. The theory is the usual text-book theory, and the practice is all quite standard. There are many comparisons of sizes and other figures. Everything seems to have been done most carefully. The illustrations have been thought out well, the enormous number of calculations seem to be accurate (it is obviously impossible to check them all, but several that have been worked out by the reviewer are correct), and there are many pages of tabular matter. Of course, the data must be reliable in such a book, or there will be trouble. The last appendix seems superfluous, as every student and draughtsman has—or ought to have—an engineer's pocket-book. If the last 70 pages of tabular matter had not been set, we might have had most excellent value at less cost. However, we must not grumble, because our admiration for the book is considerable. It has been said, quoted and repeatedly re-quoted that "of the making of books there is no end," but there are many whose authors have merely ploughed the sands and worried the publishers. This is one of the books which were wanted. We suspect that there will be few designers

of internal-combustion engines without it at the end of a year. The author had previously written a most useful book on the steam engine. We are sorry that he did not more rigidly follow the same general style of that volume. This book is certainly a useful production, and we commend it to the advanced student of technology.

TEMPERATURE EXPERIMENT WITH A CUT-OUT FITTED WITH TIME LIMIT DEVICE.

By DANIEL H. OGLEY, B.Eng., Royal Technical Institute, Salford.

In this particular time-limit device a small piston, which is attached to the plunger of the cut-out, moves in a cylinder containing about $\frac{1}{8}$ in. of pure glycerine. The plunger is

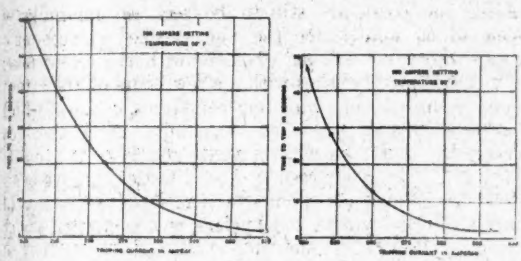


Fig. 1.

prevented from rising immediately the current reaches the value indicated on the particular setting, by reason of the viscosity of the glycerine.

It is obvious that the time taken to release the piston will depend to a great extent upon the thickness of the glycerine, and this latter upon the temperature.

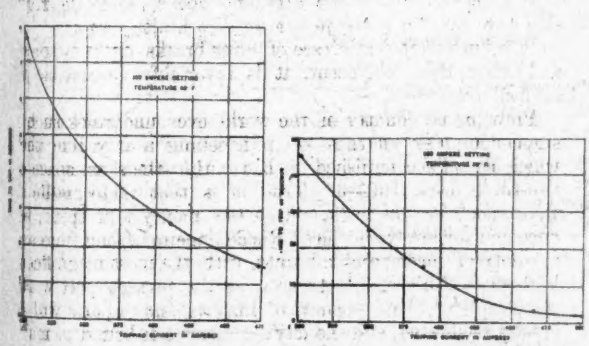


Fig. 2.

To ascertain the effect of temperature on the time of release of a cut-out fitted with such a device, the following experiments were made :—

The surface of the piston and the cylinder cover were first carefully cleaned to avoid any possibility of sticking, and the

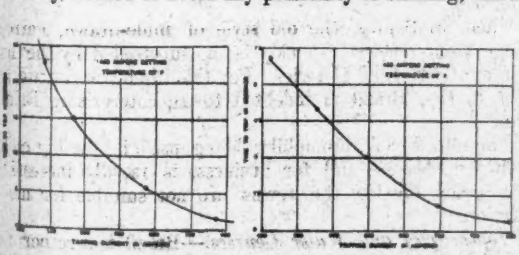


Fig. 3.

cut-out was then set to trip at 75, 100 and 150 per cent. of normal current—800 amperes in this case.

A first series of readings was taken at the laboratory temperature of 53° F. connecting current with time taken to trip. The time-limit device was then surrounded with a water heater and a second series of readings taken at a likely switchboard temperature of 80° F.

The results shown in the accompanying figures prove conclusively that it is useless to attempt to calibrate a cut-out fitted with such a time-limit device, except at the temperature at which it will have to operate.

NOTES FROM CANADA.

[FROM OUR SPECIAL CORRESPONDENT.]

Four weeks ago mention was made in these notes of the British Canadian Shipbuilding and Dry Dock Co. Since then an Order in Council has been passed by the Governor-General of Canada approving of the plans and specifications of the company for the erection of a dock and ship repair plant at Sydney, Cape Breton. The cost is estimated at nearly £1,000,000.

The town of Prince Rupert, B.C., is apparently destined to become great in the next few years. The Grand Trunk Pacific Railway Co. have made it their western terminus, and tenders have already been asked for excavation work for a new station site, dry dock and shipbuilding yard. In the summer a big syndicate was formed under the name of the Prince Rupert Hydro-Electric Power Co., Ltd. Control of various water powers within about 50 miles of the town has been obtained, and it is expected that from 25,000 to 30,000 H.P. will be available. In the larger towns here, at any rate, the reign of the overhead wire seems to be coming to an end, and conduit and underground cables are replacing it. It is wonderful in how many instances the old country, though so slow and behind the times (?) seems, after all, to be somehow (dare we say it ?) a little in advance of the New World.

Montreal recently created a special Commission to deal with the question of putting all cables and wires underground; Toronto has already done a good deal in this direction, and now Hamilton is talking about it. The matter is not one of æsthetics only, though that side is not by any means overlooked, but of utility and cost and safety. A mass of tangled wires, hanging helplessly in the streets, is no uncommon sight after a storm, this state of things being neither good for the supply and other companies nor for the public, the latter being often in considerable danger of electrocution. Some of the British conduit and cable makers ought to reap advantage from these changes.

Static Electricity and Explosives.—A curious accident at the works of the Cotton Powder Co., Ltd., near Faversham, in June last, which unfortunately resulted in the death of a workman, is the subject of a report by Major A. Cooper-Key which was issued last week. It appears that the man was engaged in spreading a mixture of fulminate composition on a rubber cloth for the purpose of drying it; the weather had been exceptionally dry and warm, and the man wore rubber shoes. The mixture—consisting of fulminate of mercury, chlorate of potash and gun-cotton dust—was probably drier than was supposed, and the friction between the fingers of the deceased workman and the rubber cloth, it is believed, gave rise to a static charge, and eventually to a spark from the man's fingers which ignited the mixture and caused it to explode, destroying the building and practically blowing the workman to pieces.

The formation of static charges and resulting sparks is a phenomenon not infrequently met with in gun-cotton drying houses and similar places, and in the course of the inquiry which followed this accident it was found that such sparks could readily be produced under the stated conditions, and that gun-cotton and fulminate mixtures could be exploded by short sparks. No similar instance, however, appears to be on record, and the explosion was regarded as purely accidental. Acetone vapour was ignited by a spark from a man's finger in 1901, at Ardeer, and the operators were afterwards protected by means of copper rivets in the soles of their overshoes. The trays in gun-cotton stoves are also frequently fitted with strips of copper for the same purpose. The occurrence is certainly of exceptional interest.

BRAZIL: ITS PRESENT CONDITIONS AND THE POSSIBILITIES FOR FUTURE COMMERCIAL RELATIONS WITH GREAT BRITAIN.

By C. E. BEST and H. L. PARROTT.

Note.—In presenting this series of articles to the readers of the Electrical Review the writers have one great aim in view, which is to bring Britishers into closer relation and more intimate understanding with the new epoch of progress and development upon which Brazil has lately entered, and at the same time point out to both enterprising firms and to serious capitalists a means of employing their energy in many undertakings which now present themselves, and only await the advent of enterprise and capital.

Having resided many years and travelled much in Brazil, and having been personally connected with finance, commerce and engineering works in the country, they are anxious to convey to others the optimism and ambition which its wonderful wealth, enormous natural resources, and unique position have engendered in them.

They feel justified in prophesying that Brazil will, within the next 20 years, prove herself to be as rich as South Africa in gold, minerals and diamonds, and richer than any other country in agriculture and timber.

They trust that their good intentions will fully condone all faults and omissions which may be encountered in these articles. They will be glad of an interchange of opinions, and are willing to give all information possible upon the subject to those who are desirous of same.

To many people the name of Brazil still only conveys a vague notion of a country covered with huge expanses of tropical forests, the major part of which are still unexplored, but which are infested by every species of wild animals, snakes, &c., and for the rest of it, overrun by many tribes of wild Indians; also that the country generally is a hot-bed of deadly fevers, such as yellow jack, malaria, &c., and all suffering under a tropical climate which only a negro can endure.

Now a reputation for some of these features was without doubt somewhat justified in the past, though for the most part the terror of the fevers is now only history. while the climate is not nearly so bad as people at home imagine.

Brazil is vast beyond the idea of most people, its area being almost equal to that of Europe. Its tropical forests are probably unsurpassed in extent by those of any other country, while the wonderful variety of timber found therein, makes the richest collection the world can produce. In realising these facts, one is astonished that more foreign enterprise has not been manifested in endeavours to develop the timber industry.

As a proof that the Brazilians recognise the latent riches around them, we would state that a local company has just been formed with a capital of some £350,000 to develop the industry in part of the State of São Paulo alone. We (the writers) confess with regret that had we been 12 months ahead in our endeavours to float a company in England, this business might have been ours. However, we take heart, as we wish our readers to, for there is still much which may be accomplished in Brazil, with enterprise and capital.

Indians.—Unless the traveller intends exploring the interior of Brazil, he need have no fear whatever of Indians. The indigenous tribes have always receded further inland in response to the white man's intrusion—though at times their protest has ended in mortal combat to both sides, as in some cases of long railway extensions.

The Indian is seldom seen in the interior towns even, but when he does appear, it is a proof that he is already somewhat "domesticated," and ready to submit to the white man's power and *régime* of living.

Wild Animals.—From our experience it would appear that most wild animals, including the jaguar, are far more frightened of a man than we need be of them. On one occasion a large jaguar had followed for some distance one of us who was on foot in a forest. Only when retracing his steps did he realise the danger, but at his approach the beast had also turned, and disappeared.

Snakes are generally the cause of fear to some travellers, and not without reason, as there are many species of venomous cobra in Brazil, as well as the deadly rattlesnake. But most of them are timid, and make away as one approaches. The great danger is when one or one's horse happens to tread on a sleeping snake. But death may easily be avoided, even when bitten by a venomous snake, if the traveller will furnish himself with the anti-poison serum, which is prepared in a special institute in S. Paulo. There are two special serums, prepared from the actual venom of the snake, which is a sure antidote if injected into the person bitten within a limited time—several hours it may be in some cases—and there is another kind of serum which may be effectively used when one is not certain of the kind of snake which may have bitten a victim.

Fevers.—Upon this matter also there is much erroneous opinion existing in the minds of people "at home." Unfortunately, 20 years ago Brazil did deserve the bad reputation then current as to the danger of catching fever by those who went to the country.

Now, to fully understand how little there is for the white man to fear from fevers, it is well to state that all credit is due to the Federal Government for their great efforts and marvellous achievements in removing one of the greatest barriers to progress in the country, *i.e.*, yellow fever. It was in the year 1850 that the first case was reported, but it soon gained such a hold on the place, that in the years 1850-89 it claimed 35,500 victims in Rio de Janeiro alone.

Along the coast are still to be seen several hulks of vessels which were abandoned and wrecked on account of the crew becoming stricken wholesale with the yellow fever, and men becoming victims within a few hours of the attack. There are three wrecks lying south of Santos, in one of which, it is reported, only one man was alive when the boat foundered. But the Government attacked the matter boldly, and by rigid measures and drastic improvements, which necessitated the wholesale demolition of many old houses and even streets, the hygiene and sanitation of the large cities became so much improved, that to-day they are regarded as being more healthy than many European cities. The death rate of Rio is 20·7 per 1,000; S. Paulo, 20·8; Curityba (Brazil), 14·9; Paris, 17·6; Rome, 24·0; Madrid, 28·0. The cause of infection was traced to the mosquito, against which was organised a campaign to exterminate it, and this has proved entirely successful in preventing further epidemics.

The improved sanitation and drainage of the town of Santos, together with the excellent docks along the river side have won for it the reputation of a health resort.

It is but rarely that a case of fever breaks out nowadays, and when this does occur, it is invariably susceptible to medical treatment.

Probably no country in the world ever undertook such a stupendous task as that of remodelling a city like that which Brazil accomplished in Rio within the short space of two-three years, 1904-6. True it is that many millions were spent on the work, but it was money well spent, for once and for always it placed Rio de Janeiro beyond reproach as a city of incomparable beauty, with the most magnificent harbour in the world. As soon as the present port works are completed, the movement of imports and exports will be greatly facilitated, and the city's commerce is bound to make rapid progress.

To-day, therefore, Brazil has some model cities, with most of the modern advantages of sanitation and general comforts, railways, &c., which compare favourably with our own provincial towns. In Rio de Janeiro and São Paulo there are established electric tramway systems as excellent as any in Europe. But for these Brazil has to thank a Canadian enterprise.

Then, in Santos, the old style of mule-drawn, narrow-gauge tram service is quickly being superseded by the new system of overhead electric. For this improvement, we are glad to say, Brazil is indebted to an enterprising British firm.

The number of automobiles being used in the big cities, both for pleasure and for business, is rapidly increasing. The roads outside the towns are not suitable for motor traction.

Topography and Water Courses.—Brazil is a rather undulating country, with large plateaux extending into the interior. The natural consequence is that there is a plentiful supply of running water in all parts. It is rather a strange, though significant fact, that the great River Paraguay, which

empties into the River La Plata, by Monte Video, rises on one side of a small range of hills, while the River Tapajoz, which flows into the River Amazon, rises on the other side of the hills, a short distance away. Hence there is almost a complete watercourse intersecting the whole of South America, an approximate distance of some 4,000 miles.

As might be expected in an undulating country like Brazil, there are many rapids and waterfalls in the rivers, and a great number of them might easily be harnessed to generate electric or hydraulic power.

It is not generally known that there are two waterfalls in Brazil with an estimated volume of fall greater than that of Niagara. These are the Paulo Affonso, in the River San Francisco, and the Iguassu, in the River Parana. But there is ample water-power in all parts at present running to waste, which may, with the greatest advantage, be adapted to the service of many industries.

In the capital of Sao Paulo, the Sao Paulo Tramway, Light and Power Co.—a Canadian company of very creditable enterprise—obtained a concession to generate electric power from the River Tieté. They constructed a dam across the river, some 20 miles distant from the town, where, within a stretch of ½ mile, there is a difference of 33 ft. in the level of the river.

Some large reservoirs, fed by three iron conduits 14 ft. in diameter and ½ mile long, work several turbines, which run the generators. Sufficient electric power is generated and conducted to S. Paulo to run an excellent tramway service and furnish power to drive many large factories as well as supply light for public and private use.

The majority of industrial houses in S. Paulo depend absolutely upon this electric light and power, in spite of the fact that there is an excellent supply of gas, furnished by an English company.

Since the arrival of the Light and Power Co., there has been keen competition between them and the Gas Co. for supplying public and private lighting, but the Gas Co. is well established, and by good management has not suffered from the contest.

It is only some 12 years ago that the S. Paulo L. & P. Co. went to S. Paulo. At this time there was a poor service of mule-drawn trams, owned by two or three companies. The new company had to overcome tremendous opposition, and many difficult obstacles, before they could install themselves satisfactorily, and it was some years before they were real masters of the situation.

The old companies sent out gangs of men at night to pull up and destroy the work of laying the tramlines which the new company had done during the day. Naturally conflicts often ensued between the parties of the opposing companies. Added to this there was much opposition encountered from influential men and politicians in obtaining further concessions and protection of their labours.

It was only by indomitable courage, tremendous enterprise and patience, with the expenditure of very large sums of money—much of which undoubtedly was never anticipated before the scheme was entered upon—that they won their position beyond all dispute.

We venture to emphasise these facts, in order that British firms may appreciate what others have endured to accomplish their aims. In this case their efforts have been well rewarded, as well as in Rio de Janeiro, but of that scheme, more anon.

We would appeal to those persons or companies who wish to secure business interests of any kind whatever in Brazil. They must convince themselves of one salient fact, viz., that the Brazilian to-day is very wide awake to the possibilities and latent resources of his country, and though he, the Brazilian, is not able to undertake all the labours necessary to improve and develop the country on account of the want of national capital and men, he has decided to secure the best possible work and greatest advantage from the foreigner. It is therefore the best men who will win in the race for the biggest prizes.

British firms must be ready to *sink* their capital (some of it definitely), but the greater part for a year or two only, after which they may hope to reap handsome profits. They must treat all their own men, and all those with whom they have relations in Brazil, in an open-handed and generous manner.

To study petty economy will bring a crop of disappointments and difficulties, while the return on the capital expended will be far less in proportion than on the more liberal outlay. Capital is an "Open Sesame" in Brazil, so long as it is backed by keen diplomacy, thorough ability, and perfect organisation. Our competitors have shown us an example, but for that very reason they are now leading the way in many directions where the Britisher should be foremost.

Though with no wish to depreciate the many excellent achievements of Englishmen abroad, we say that in our experience it seems necessary for an Englishman to go abroad for some time in order to realise the sundry deficiencies of his countrymen in business, as well as to recognise the good qualities of our foreign competitors. Our desire is to stimulate our compatriots to regain and hold their well-merited position as the premier nation of the world in all commercial respects.

(*To be continued.*)

PROPOSED HYDRO-ELECTRIC DEVELOPMENT ON THE RIVER MAIPO, NEAR SANTIAGO-DE-CHILE.

[FROM A SPECIAL CORRESPONDENT IN CHILE.]

The rapid change that has taken place in the development of Chile during the last 10 years is astonishing. Nowhere, however, is this change so marked as in the capital, Santiago.

From a badly built, badly paved town it has suddenly become a modern city of 400,000 inhabitants with fine buildings and well-paved streets.

The increase in the commercial activity has caused an enormons suburban development, and the centre of the city has taken on a more commercial aspect.

The increased value of property has compelled owners to divide off their buildings into offices to accommodate the increasing commercial world, and the smaller rent payers have been pushed out to the cheaper property of the suburbs.

This shifting in the population has created a demand for further travelling facilities across and through the city.

In the suburbs small industries of every kind have cropped up, thus creating a demand for motive power.

There is also a constant demand for light as the city extends, and in the whole of the agricultural districts around Santiago there is a demand for power.

The present electric supply is in the hands of the Chilian Electric Tramway and Light Co., which has been working under great difficulties, and cannot by force of circumstances cope with the demand for energy.

In the first place, this company made an unfortunate contract with the municipality, in which it undertook to limit its tariff for passenger carrying, and in the second place, in the development of the water scheme it undertook to pay a very large sum for the use of the water which passes along the Canal de Maipo for irrigation purposes.

These two circumstances restrict the earning power of the business, and consequently there is not the desire that should exist to push the traction system further than the present contract compels. Under the arrangements with regard to lighting the company may charge an unlimited price per unit, modified only by the competition with the gas interests, whose charges are extremely high. It, therefore, makes this a paying part of the business, but as its contract is limited to the city of Santiago, it has no desire to push its mains into the suburbs, where it would not be a paying business to carry the traction service also.

This situation with regard to electric supply makes it absolutely necessary to look to other sources to satisfy the growing demands of the new districts, and it is not surprising that another undertaking is contemplated which shall be capable of meeting the demands which actually exist, the neglect to provide for which threatens to restrict the natural development of Santiago and its suburbs.

With a basis of the electrification of the railway between Santiago and Puente Alto a concession has been granted to Senor Julio Subercaseaux to use the waters of the river Maipo to develop power at San Juan de Pirque (October, 1911).

The water will be taken from the river near El Volcan and a canal built on the south bank of the river about 18 miles long; the fall at San Juan will be over 400 m. (1,320 ft.) and the minimum quantity of water will develop nearly 60,000 H.P.

The hydro-electric station will be placed at San Juan, under 20 miles from Santiago, and high-tension mains will be carried to Puente Alto and Santiago.

After the electrification of the railway between Puente Alto and Santiago, the surplus power available will be enormous, but no greater than the necessities require.

Apart from the public lighting of the various suburbs around Santiago, there is a field for lighting in the city itself, as competition with the present company will be useful to the public.

Then there is an absolute necessity for better travelling facilities in the suburbs, where the concessions of the present company do not extend, and where it has no desire to go on account of the low fare that must be charged.

The State Railways require power for the electrification of the very bad section to Valparaiso over the Tabon, and this new source of electric supply will facilitate this important improvement to the great benefit of the State Railway service.

Within the past few years the use of acetylene gas has extended so much that actually the importation of carbide of calcium is so great that a company contemplates setting up an installation for its manufacture. This is another direction in which the power of the River Maipo can be profitably used.

In every direction in and around Santiago there is a demand for energy in the form of power or light or heat, so that there is no question that the development of the water power embraced in the concession of Senor Subercaseaux will find a ready market, and will assist in an important way in the development of Santiago and district.

In the electric concessions which have also been conceded to Senor Subercaseaux there is no limitation to the prices that may be charged, and as there are no burdens to be borne, such as payment for the use of water, &c., similar to those which handicap the present electric supply company, it is evident that this will be a great and important business, which must become a source of profit to the capitalists into whose hands the concessions finally fall.

The definite studies are now being made, and we understand that suggestions as to the application of this new source of power will be received and welcomed by the owners of the existing railway from Santiago to Puente Alto, or the concessionaire, Senor Julio Subercaseaux, Calle Compania 1,213, Santiago-de-Chile.

SOME REMARKS UPON LONDON ELECTRIC TRAMWAY SYSTEMS.

By A. H. M.

Recent returns showing the enormous number of passengers dealt with by the London electric tramway systems, bring vividly to the mind the immense importance of this system of transit to Londoners. The writer is a frequent passenger on the cars of the different authorities, and has been strongly impressed by the possibility of improvement in various directions.

Both the L.C.C. and other systems of cars appear to suffer from a serious defect in the direction of badly-designed staircases.

A man approaching 6 ft. in height must ascend with the utmost care, or he will surely have his hat crushed by some ledge or other projection. Another defect (and one quite easily remedied) is that it is often impossible to obtain a continuous hold on the handrail on account of the fact that various obstructions meet the hand during the progress upward, or because the handrail is not a continuous and convenient one following a suitable curve at a proper level for a person of average height to grasp. It appears to be quite beyond dispute that designers have failed to supply what is required in this direction. Another source of danger is the fixing of boards outside the rail, but so close to it that the fingers become jammed between the two.

In these days of hurry, when cars are started whilst passengers are still climbing up, these defects constitute a source of danger, and should be remedied.

Those using the L.C.C. cars fitted with top covers can scarcely have failed to feel the draught which is encountered when the windows are lowered for ventilation. This is a particularly unfortunate defect, and one which mars the benefit which the public undoubtedly derive from the top covers in cold or wet weather. The question arises whether this draught can be avoided. The writer has given careful consideration to the matter, and is of opinion that the difficulty can be overcome by the employment of a proper system of ventilation. For instance, a small fan (suitably protected against the weather) could be fitted into the roof in such a manner as to draw away the foul air, whilst fresh air could be admitted by ducts placed high up at the sides. A fan taking ·2 of an ampere at 500 volts would probably do all that is required. If necessary, of course, other methods could be employed, but the writer feels satisfied that the difficulty is one which can be completely overcome.

Cars running on systems where top covers are not provided, place the public at a considerable disadvantage during wet or cold weather, and a natural result is the overcrowding of the interior. It, at the same time, appears to be beyond dispute that the tramway authorities lose considerable revenue in the course of a year, as many people prefer the train or other method of conveyance under such circumstances.

Assuming that there are valid and sufficient reasons why top covers of the ordinary type cannot be fitted, there is still the possibility of devising some sort of shield which would protect outside passengers from the worst of the wind and weather.

After making due allowance for the necessity of economising time, the writer considers that the starting acceleration and the stopping retardation of the L.C.C. cars are excessive. Although this appears to be general on the L.C.C. cars, it is not apparent on the cars of other systems. This fact would render it evident that the cause is to be found in the design of the controller and brake equipment. Of course, the danger here is that passengers may be thrown down if not actually occupying seats when the car starts or stops.

The writer fully recognises the splendid service which electric car systems have given to the workers of London, and sincerely trusts that their utility may be still further increased by the elimination of the defects which have been indicated.

Water-power in Germany.—Two further instances of proposed municipal co-operation with private enterprise are reported from Munich and Nuremberg respectively. In the former case a syndicate, which intends to utilise the water-power of the Leitzach with the aid of the Seeham Lake as a storage dam, has offered to supply the Munich city authorities with electric power, and the latter have agreed to the principle of the scheme. The syndicate will form a company for the purpose of carrying out the undertaking, and the Munich authorities will subscribe for 51 per cent. of the share capital, and become customers for 20,000,000 KW.-hours per annum. It will also be necessary for the Council to expend £60,000 for the erection of a transmission line 18·6 miles long between the Leitzach works and Munich. The second instance relates to the proposed formation of a company to establish supply works by the utilisation of the water-power of the Walchen Lake, and the delivery of power to Nuremberg, Furth, and to the projected station for Central Franconia. The town of Nuremberg would participate in the company to the extent of 51 per cent. of the share capital, whilst the balance would be equally divided between the town of Furth and the Schuckert Electricity Co.

An Edison Automobile.—A car equipped with an Edison storage battery of 50 cells, and capable of travelling 80 to 120 miles at 20 miles per hour, is described in a recent issue of the *Electrical World*. The car is carried on exceptionally well-designed spring suspension, and is intended for business service on country roads, which are notoriously bad in the U.S.A.

NOTES FROM INDIA.

[BY OUR SPECIAL CORRESPONDENT.]

MADRAS.—A very important street lighting contract is about to be settled by the Madras Council. It is reported that the issue lies between Messrs. Siemens and Messrs. Henley's Telegraph Works Co., whose prices are close to one another.

Recently tenders were invited for the electric lighting installation to be installed at a Madras Hospital. A specification was issued and signed by an engineer to the Corporation, and the few following excerpts may be of interest as showing what contractors are up against at times :—

1. "The whole of the work to be done in accordance with the most recent rules of the Institution of Electrical Engineers."

2. "*Distribution Boards.* . . . . One double-pole main switches to control the whole of the lights. All switches to be on one pole."

3. "*Casing.*—Tenderers should specify (in detail) and carry out work in accordance with the recent rules of the Institution. Tenderers to specify clearly how they propose to do work in the kitchens."

4. "*Incandescent Lamps.*—Tungsten to be of best brass collar type of the best make. Any lamp failing within two months of current being switched on to be replaced, unless glass is broken."

5. "Switches should be generously distributed throughout the installation, each lamp must be able to be turned off if its light is no longer required."

6. "*Fuses.* . . . The installation should be so designed as to be capable of taking 10 per cent. of the total candle-power specified in the schedule, and 30 per cent. of the fans specified in the same schedule."

7. "*Wood Casings.* . . . width of centre fillet of casings should be for main cables 2 in. ; for branch cables, 1 in. ; for single conductors, not less than 2 in. Tenderers to clearly specify how they propose to execute work in the kitchens."

8. "Fans to be similar to Crompton fan type. . . . Tenderers to submit complete specifications, including the following points—finish, motor, blades, blade-holders, speed, armature brush-holders, commutation, supporting tube, current consumption, regulator. Contractor to make *any* test ordered by the engineer."

9. "*Time.*—For installation of lights and fans within seven weeks from communication of acceptance. For lift within 10 weeks from date, &c."

10. "*Fines.*—Rupees 15 a day for every day's delay in completion. The engineer may impose a fine not exceeding 50 rupees for every occasion on which he notices unsatisfactory work. . . ."

Comment is scarcely necessary. A tenderer who could satisfy the above conditions, who could import and erect a lift within 10 weeks, who could design the installation so as to make it capable of dealing with 10 per cent. of its total candle-power, who could "specify clearly how he proposed to execute work in the kitchens," who could calmly submit to a fine of Rs. 50 each time his lordship the "engineer" was pleased to find fault—such a tenderer should forthwith be canonised. It is not at the moment widely known who got the contract, and it would be interesting to find out later how things developed.

The result of the railway and shipping strike in England is now being keenly felt in India, and particularly by those firms who have to work to a definite date, such as at the Delhi Durbar, some of whose consignments are now overdue. The congestion at the ports is intense, and at the goods stations of the railway companies it is simply confusion ; at the new goods station of the Durbar it is confusion worse confounded. To add to the seriousness of the matter, there is a rumour of a threatened strike among the railway hands generally. These men (natives, of course) are keenly alive to their own interests, and feel their position is considerably strengthened by the fact that the success of the Durbar is very largely dependent on the smooth and efficient working of the Indian railways during the next couple of months.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

AMENDMENTS.

AUSTRALIA.—The Australian Customs authorities have issued the following decisions regarding the duties to be levied on certain imported goods.

Master clock and 31 dials electrically operated therefrom	20 %
Cut-out and hanger for arc lamp	10 %
Condensers : Steam engine	20 %
Other	25 %
"Fepco" sheeting, a composition of asbestos and rubber used chiefly as a packing for pumps	20 %

The Customs authorities have also decided that "wholly manufactured" for certificate of origin declaration purposes means that all the manufacturing processes shall have been performed in the United Kingdom from unmanufactured raw material of foreign origin irrespective of the proportion of British labour in the factory or works cost of the manufactured articles. Such goods will be entitled to preference.

TURKEY.—The Customs authorities have decided that machinery and tools imported into Turkey for the first installation of factories, or their enlargement, as also Decauville (portable) railways, aerial wire transporters, and spare parts, necessary for facilitating the transport of raw material and products of such factories, shall be admitted free of Customs duty.

In this connection, the Customs authorities have decided that, in order to prevent abuse, importers of the foregoing articles must present to the Customs Department a declaration from the Ministry of Public Works certifying that the material to be imported is entitled to benefit by the exemption accorded by the law.

The duties collected on machinery and tools for the first installation of factories since the date on which the Imperial Iradé sanctioning such exemption expired, are to be returned to the importers.

A Motor-of-all-Work on a Farm.—Mr. C. D. Bellows has a 640-acre farm 4½ miles from Maryville, Mo., and not only lights his house, barns and grounds by electricity delivered over his own transmission line from the Maryville central station. but performs his farm work with a 20-H.P. induction motor, mounted on skids, which can be moved about his place and attached at any of the numerous connections in his barns and silos.

The three-phase, 60-cycle, 2.300-volt transmission line was built by the local electric light company, of which Mr. C. C. Hellmers is manager, at the expense of Mr. Bellows, and is of best construction, with painted poles, creosoted butts, &c., costing the owner about $425. In the case of another line serving a farm installation 4 miles north-east of Maryville, the farmer attempted to economise by building his own line, and this work has given much trouble.

Mr. Bellows' meter is mounted in a pole box at his farm, and he pays the same rate as the regular Maryville town customers.

The lines on the farm premises are tapped at nine points for motor connections. At each of the three barns and four silos the taps are brought to knife switches, from which hang the wires for attaching under the binding posts of the motor unit terminals. The motor which is used for general work about the Bellows farm is a 20-H.P. machine of the three-phase, squirrel-cage induction type mounted on 8-in. × 8-in. skids, with its starting compensator. The motor unit can be rolled up to any machine to be driven, the wires being slipped into the terminal blocks and the switch closed. The cut-out switches are, of course, ordinarily left open when not in use, to prevent contact between the jumper wires.

This motor has been handled in the characteristic rough manner given farm machinery, and is frequently left out in the rain and wet weather without perceptible damage. It has now been in service nearly two years. Mr. Bellows also pumps his water supply by electricity, having a special 5-H.P. motor for this purpose.

During the last season 45 acres of corn on this farm were cut up into ensilage, the work being done by the 20-H.P. motor in 1½ days, or less than half the time formerly required with a gasoline engine. The Bellows installation is a thoroughly practical one, which has been given two years of the hardest service, and the owner declares that he would on no account return to the gasoline engine he formerly used.—*Electrical World.*

Personal Representation in the Argentine.—The importance of personal representation in foreign markets is once more driven home to the minds of British manufacturers in Mr. H. M. Mallet's Consular report on the trade and commerce of the district of Rosario, Argentine Republic, for the year 1910. As has been said so often before, he remarks again, that time and money are simply wasted by posting circulars to merchants. "Competition to secure orders has become so keen that some of the large firms trading with this country have agents residing here, whose business is simply to watch trade interests and visit all the larger towns, with a view of studying requirements and obtaining orders. By this method merchants and travelling agents have become acquainted, and large orders are not infrequently arranged on terms to suit the parties concerned."

NEW PATENTS APPLIED FOR, 1911.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

23,314. "Holders for telephone receivers." J. TRENNER. October 23rd.

23,334. "Electric insulators." G. FULLER and G. J. A. FULLER. October 23rd.

23,359. "Automatic electrically-governed engine-controlling apparatus." H. D. HINCKLEY and W. D. HALLIDAY. October 23rd. (Complete.)

23,393. "Telephone coin-collector." W. FAIRWEATHER. (Baird Electric Co., United States.) October 23rd.

23,407. "Means for actuating automatic electric and other alarms." A. J. CUMING. October 24th.

23,414. "Dynamo-electric machines." L. J. HUNT and SANDYCROFT FOUNDRY CO., LTD. October 24th.

23,418. "Electromagnets." D. E. BARNES and A. A. G. JENSEN. October 24th.

23,439. "Process for charging or regenerating the plates of accumulators." TRAUTMANN & MAYER. (Convention date, October 24th, 1910, Germany.) October 24th. (Complete.)

23,441. "Combined switch and plug connectors for electric wiring." D. S. MUNRO. October 24th.

23,495. "Apparatus for actuating conduit covers and collector ploughs of electric railways." D. D. SAMAIA. October 24th. (Complete.)

23,500. "Means of and apparatus for recording calls made by telephone." E. H. BRIDGE. October 24th. (Complete.)

23,508. "Semi-automatic telephone exchange systems." F. R. MCBERTY. (Convention date, October 24th, 1910, United States.) October 24th. (Complete.)

23,542. "Magnetic motor." W. H. BRIGGS. October 25th.

23,546. "Apparatus for electric light advertising and illuminations." A. B. BARKER and J. H. BARKER. October 25th.

23,548. "Windings of electric generators and other electrical machines." P. R. JACKSON & Co., LTD. October 25th.

23,549. "Field coils of series wound electric motors." P. R. JACKSON & Co., LTD. October 25th.

23,565. "Supports for electrical conductors." CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., and C. W. KAY. October 25th.

23,566. "Means for suspending electric conductors." CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., and C. W. KAY. October 25th.

23,614. "Transmission gear for the electric lighting of railway vehicles and other vehicles." J. STONE & Co., LTD., and A. H. DARKER. October 25th.

23,622. "Plug receptacles for electrical apparatus." SOC. SNON. FABRIEK VAN INSTRUMENTEN EN ELEKTRISCHE APPARATEN "INVENTA." (Convention date, November 4th, 1910, Belgium.) October 25th. (Complete.)

23,630. "Electric planer drives." B. WIESENGRUND. October 26th.

23,663. "Electric insulators." J. H. ELLIS and BRITISH INSULATED AND HELSBY CABLES, LTD. October 26th.

23,725. "Incandescence electric lamps." C. CARANGELO. Convention date, October 27th, 1910, France. Addition to 21,740/10.) October 26th. (Complete.)

23,731. "Electric telegraphy." J. A. L. DEARLOVE. October 26th.

23,733. "Regulators for electric distribution systems." BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States.) October 26th.

23,734. "Circuit-controlling devices." E. M. HEWLETT. (Convention date, October 29th, 1910, United States.) October 26th. (Complete.)

23,781. "Protecting devices for electric lamps." W. E. PERRY and S. DAVIES. October 27th. (Complete.)

23,788. "Electric lamps." K. R. SMITH. October 27th.

23,789. "Apparatus for automatically operating gas or electric lamps." C. R. OLIVER. October 27th.

23,823. "Common battery telephone systems." AKTIEBOLAGET L. M. ERICSSON & Co. (Addition to 21,924/11. Convention date, November 9th, 1910, Sweden.) October 27th. (Complete.)

23,824. "Common battery telephone systems." AKTIEBOLAGET L. M. ERICSSON & Co. (Convention date, November 9th, 1910, Sweden.) October 27th. (Complete.)

23,830. "Electrical water heaters." L. KATZ. October 27th. (Complete.)

23,846. "Automatic electrical signalling systems for railways and the like." W. C. HAWKES and E. J. CLEBURNE. October 27th.

23,882. "Circuit-breakers for rotatable controllers for electric circuits." J. A. HIRST and P. S. BROOK. October 28th.

23,910. "Three-contact plugs for telephone switchboards or the like." SIEMENS BROS. & Co., LTD., and W. H. GRINSTED. (Siemens & Halske Akt.-Ges., Germany.) October 28th. (Complete.)

23,918. "Common battery telephone systems." AKTIEBOLAGET L. M. ERICSSON & Co. (Addition to 23,824/11. Convention date, February 7th, 1911, Sweden.) October 28th. (Complete.)

23,929. "Electromagnetically operated clutch mechanism." H. A. CUTLER. October 28th.

23,931. "Photographic apparatus for indicating and measuring changes in electrical pressure." J. S. DOW. October 28th.

23,937. "New or improved machine or device for use in connection with telephones." H. S. BRYANT and THIRD HAND PATENTS, LTD. October 28th. (Complete.)

23,943. "Process for the closing of the longitudinal seams of tubes by electrical resistance welding." GESELLSCHAFT FUR ELEKTROTECHNISCHE M.B.H. (Convention date October 29th, Germany.) October 28th. (Complete.)

23,945. "Protection of electric circuits." G. NORTH. October 28th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1910.

AUTOMATIC SWITCHING IN-AND-OUT DEVICES FOR DYNAMO-ELECTRIC MACHINES WORKING IN CONJUNCTION WITH ACCUMULATORS. H. F. Foster. 23,877. October 10th.

ELECTRIC SWITCHES. A. Eckstein and A. C. Heap. 23,525. October 11th.

SPRING CONTACTS FOR ELECTRIC SWITCHES, FUSES AND THE LIKE. A. Eckstein and A. C. H[illegible] 23,526. October 11th.

ELECTRIC SWITCH[illegible] G. L. Welford. 23,622. October 12th.

ELECTRIC WELDI[illegible] E. B. Koopman and Pontelec Welding Patents, Ltd. 23,735. October 13th.

ELECTRIC SWITCHBOARDS. A. Eckstein and A. C. Heap. 23,894. October 15th.

ELECTRIC DRIVING APPARATUS FOR MACHINES FOR PICKING METAL PLATES OR SHEETS. F. C. Anderson. 23,957. October 17th.

APPARATUS FOR THE PRODUCTION, STRENGTHENING AND RECEPTION OF ELECTRICAL VIBRATIONS. J. Schiessler. 24,696. October 24th.

PORTABLE DEVICES FOR TRANSFORMING CONTINUOUS ELECTRIC CURRENTS. L. B. Miller. 25,055. October 28th.

ELECTRIC PROCESS FOR DRYING TIMBER. Alcock & Co. Proprietary, Ltd. 25,175. October 2[illegible]th. (November 5th, 1909.)

GALVANIC BATTERIES. W. Morrison. 25,815. October 31st. (November 22nd, 1909.)

CONTRIVANCE FOR FACILITATING THE FASTENING OF ELECTRIC CONDUCTORS TO WALLS OR OTHER SUPPORTS. T. James and C. Jones. 25,846. November 7th.

UNIVERSAL ANGLE GRIP FOR FLEXIBLE ELECTRICAL CORDS. A. C. Chapman and H. E. Mason. 26,909.

COMBINED BELL-PUSH AND TEMPERATURE ALARM. C. Heath. 27,508. November 20th.

ELECTRICAL SWITCHES OF THE TWO-WAY TUMBLER TYPE. T. H Tucker. 27,903. December 1st.

1911.

METHOD AND MEANS FOR CONNECTING ELECTRICAL CONDUCTORS TO BRUSHES FOR DYNAMO-ELECTRIC MACHINES. British Thomson-Houston Co. (General Electric Co.) 76. January 2nd.

SPARK-GAPS OF IGNITION PLUGS. F. Lux. 325. January 5th. (May 4th, 1910.)

ELECTRIC LETTER-BOX SIGNALLING DEVICES. R. J. Warin. 365. January 6th. (May 1st, 1911.)

BRUSH-HOLDERS FOR DYNAMO-ELECTRIC MACHINES. M. Walker. 1,838. January 18th.

COMBINATION LOCKS FOR ELECTRIC SWITCHES AND OTHER SERVING DEVICES. T. D. Robinson. 2,722. February 2nd.

ELECTRIC SIGNS. H. Bey. 3,759. February 15th.

APPARATUS FOR THE RECTIFICATION OF ALTERNATING ELECTRIC DISCHARGES. U. Magini. 3,865. February 15th.

ELECTRIC FANS. W. J. Railing and A. J. D. Krause. 3,918. February 16th.

HUB-MOTORS FOR ELECTRICALLY PROPELLED AUTOMOBILE VEHICLES. V. Harhorn. 5,870. March 8th. (March 12th, 1910.)

PRODUCTION OF ELECTRICAL OSCILLATIONS BY DIRECT CURRENT. W. P. Thompson. (Ges. für Drahtlose Telegraphie.) 6,682. March 17th.

X-RAY TUBES. Touset. 7,076.

SAFETY INTERRUPTER FOR ELECTRIC TRAMWAYS WITH OVERHEAD LINE. G. Pratginestos de Bonaparte. 7,645. March 27th.

INDICATING DEVICES FOR ELECTRICAL MEASURING INSTRUMENTS. M. Strelow. 8,033. March 30th.

ELECTRIC ALARM SIGNAL. E. E. Rogers. 8,044. March 30th.

TELEGRAPH TRANSMITTERS. J. W. Mackenzie. (American Transmitter and Manufacturing Co.) 10,048. April 25th.

TELEPHONE TRANSMITTERS, RECEIVERS OR LIKE DEVICES. W. M. Crowe and British L. M. Ericsson Manfg. Co. 11,182. May 8th.

PREPAYMENT MECHANISM FOR ELECTRIC, GAS AND LIKE METERS. W. S. Sprague and Chamberlain & Hookham, Ltd. 11,929. May 17th.

AIR-PROPELLER DRIVEN BY ELECTRIC MOTOR. A. Schaeffer. 13,623. June 7th. (July 2nd, 1910.)

ELECTRIC CIRCUIT CONTROLLING DEVICES. P. Dunnind. 13,830. June 9th. (June 9th, 1910.)

ELECTRIC POCKET-LAMPS. E. Neudoerffer. 14,604. June 20th.

ELECTRIC WATER-HEATING DEVICES. H. Lofquist. 15,302. June 30th.

The Fixation of Nitrogen.—The nitrogen fixation processes of Birkeland & Eyde and the Badische Anilin und Soda Fabrik have now reached a stage when their products may be considered ordinary articles of commerce; in fact, the works at Notodden are now beginning to put on the market quantities of nitrogenous material large enough to affect the price. Notwithstanding this, however, the price of nitrogen in the various fertilising compounds still rises; sulphate of ammonia, for instance, recently crept up to £14 5s. per ton. The success of the two processes mentioned, the present high price of nitrogen compounds, the marked attention given in these days to scientific soil culture, and the production of pure nitrogen as a by-product of the present-day manufacture of oxygen by the Linde process, are giving a great stimulus to the study of nitrogen fixation. Each week sees a new process for carrying out this object. Many of these processes are extremely ingenious.

One such process has been brought out by Messrs. Nobels, the simplicity of which seems remarkable. The apparatus, in which the nitrogen and oxygen of the atmosphere are combined, consists of a hollow truncated cone, at the lower and smaller end of which revolves a set of fanner blades. Inside the cone and on the plane at which the fanner blades revolve are fixed a number of metal electrodes in a slanting position. In plan these electrodes appear as curved strips, one end of which is nearer the centre or axis of the cone than the other; the near end almost touches the tips of the fanner blades as they revolve. The truncated cone and the revolving shaft are connected to a source of high-tension current, so that a spark bridges the air gap between the tip of the fanner blades and the near end of the electrode strip. As the blades move round the gap is widened out to the maximum at the other end of the electrode strip, so that the spark is gradually pulled out in the same way that the strong magnetic field of the Birkeland & Eyde apparatus pulls out the electric arc into a broad flame. The flame of course forms an extremely thin sheet making a high temperature zone. The formation of this zone of high temperature is one function of the fanner blades, the other is to draw in the atmospheric air and project it through this flame with the formation of nitrogen oxides, which are afterwards absorbed in milk of lime in the usual manner. The consumption of energy is much less than in the ordinary process, as none is required to energise the magnets. The amount of nitrogen oxides in the air which has passed through the flame varies from 1½ to 2 per cent.